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Cooking and Boiling

A PLEA for the use of the electric kettle as an essential part of the complete cooker in our issue of October 16th last started a ball rolling on a long journey and, in spite of, or maybe because of, wanderings from the main track, with progressively increased momentum, "Still the boiling plate" brings in this issue quite a new idea. Such a volume of correspondence deserves analysis—a principle can so easily be obscured by detail.

The greater part of the matter is a condemnation of the closed hot-plate on grounds of inefficiency and slow boiling, while the low-voltage open plate is given a little, but enthusiastic, support. The heavy-element open plate has certainly toned down complaints in several quarters. Is it the real solution to the problem? If so its use should certainly not be confined to one make of cooker.

Incidentally we expect soon to see the same or a similar plate on equipment of another make. One hears that its price is prohibitive, but we urge those concerned not to let their vision become limited by consideration of price only. What rather puzzles us, however, is the use of one only of the low-voltage plates on cookers with one or two closed plates. Why not all open plates? Is it because of the cost?

There seems to be a good deal in the suggestion for a competitive trial of the different types of boiling plates by an independent authority on the lines of the Royal Agricultural Society's trials of farming appliances. What electrical organisation would see to such a proposal—B.E.A.M.A., I.M.E.A., or E.D.A.? Such work might easily prove more useful than attempts at cooker standardisation.

In the light of the main issue, to ensure that electric cooking is the best of all methods, does efficiency really enter into the broad question? We have heard very many consumers' views on the electric cooker, and the adverse ones can be summarised in the one and only complaint against the modern equipment—boiling is too slow. Indeed, in nine cases out of ten, to satisfy the consumer that he will get his morning cup of tea made speedily is to remove his grumble entirely. We agree emphatically with those who hold that the matter must be viewed from the operator's standpoint instead of from that of the engineer.

Agreed, the average hot-plate will not compete with the gas ring; but the complete electric cooker can and *does* fill its rôle better than the complete gas cooker. To ask the consumer to use a separately connected kettle is not to admit failure of anything; it is to ask him to take full advantage of what electricity has to offer him.

The Utensil Question

A GOOD deal has been said for thick and machined-bottom utensils. Judging from the symposium of engineers' views on the special utensil in the ELECTRICAL REVIEW of January 1st there is certainly a strong case for it, and if, by using such a vessel, three pints of water can really be boiled on a 1,600-W closed plate in ten minutes, we welcome it with open arms.

We have not the slightest sympathy with the suggestion for a combined electric and gas cooker. Will the supply man tolerate such a "monstrous hybrid" when what he has to offer can definitely give satisfaction to his consumers? Certainly not.

Such correspondence as that under review can do much good by the ventilating of diverse ideas, but there is a possibility of harm when there is a tendency to one-sidedness—a possibility that the unwary may be stampeded into the belief that electric cooking is unsatisfactory, or that it is not progressing.

Nothing is farther from the truth. Electric cooking is sound business for all in the electrical industry, and for the housewife, provided that such arrangements are made as will keep the cooker in order or prevent failure at vital moments.

Look at Wimbledon!

IT is not necessary for us to look far for support in our stand against those who would have us believe that electric cooking is not progressing. Look at Wimbledon. Of the thirty million kWh sold by the undertaking during the last financial year about half was used for heating and cooking. True, this may be an outstanding example, but the point is that the excellent commercial enterprise behind this progress would be useless were electric cooking not sound. During the year 469 cookers were sent out by the concern, 1.3 per day. But, after all, the total number of cookers hired at the end of the year was only 3,223—less than 0.14 per consumer. In these figures we have a fairly true indication of what can be done and what may be done—a matter for confidence, surely.

We Lead: Others Follow

ELECTRICAL manufacturers have sometimes been accused of following gas precedents in the design of their products; true, at times, gas and electric cookers have resembled each other as members of the same family, though their peculiar odours have been dissimilar. No doubt gas and electrical men often find it useful to gaze into the windows of each other's showrooms. Yet, as a matter of fact, electricity is an entirely different medium demanding a new technique and new methods of expression. In many directions this has been realised, and some articles of real æsthetic value as well as of utility have been evolved. In this way a strange position of affairs has arisen. Electricity has taken the lead, and now we find manufacturers of gas appliances producing plausible imitations of electric bowl heaters, imitation coal fires, irons in coloured enamels, cookers with thermostatic control, and so forth. Long ago they adopted a tame imitation of electric switching. Of course, they cannot be more than imitators, for gas cannot be successfully adapted to what, after all, are purely electrical designs. We appreciate the compliment, however, and flatter ourselves that there is so much ingenuity in the electrical apparatus trade that we shall never lose the lead that we have gained.

Next Month's Fair

ONLY four weeks now remain for exhibitors to finish their preparations for the British Industries Fair. Monday, February 22nd, is the opening day both at Birmingham and in London. Last week we gave our selected list of electrical and allied exhibitors, and in the present issue we publish the programme of visits that have been arranged by the Birmingham Electrical Advisory Committee. Two Wednesdays, February 24th and March 2nd, have been set apart for combined visits by delegates and members representing, on each of these days, nine separate electrical institutions or associations. On the second Wednesday, in addition to the day-time visits, there will be a special evening event—a dinner arranged by the British Electrical Development Association. On four other days there will be visits by members of other sections of the industry. It is officially announced that the Prince of Wales who has for many years taken so marked an interest in the Fair, and in British overseas trade which it is designed to foster, will visit the Birmingham Section.

Birmingham Personnel

MR. T. R. MARTIN, who has been prominently connected with the movement from the year of the Birmingham revival, is again very busily engaged as Chairman of the Electrical Advisory Committee, with Mr. H. H. Berry as deputy-chairman. Those who have followed Birmingham events at all closely will note with pleasure that Mr. E. J. Jennings, of the Birmingham Corporation Electricity Department, who has worked so hard in the past as secretary, is able to continue to render service as a member of the Committee. At the moment the only thing which remains to be said is to urge exhibitors to strive hard to have everything ready if possible by Friday, February 19th, when the Press inspection takes place, and to invite everybody electrical to enter the period February 22nd to March 2nd in their diaries as a time when they should attend the one Electrical Market event of the year. Big Home and Overseas purchases of British-made electrical products ought to be made.

Refrigeration and Salesmanship

CANDIDLY, we were disappointed in the lecture on refrigeration at the salesmanship conference of the Electrical Development Association on Friday last week. The whole thing was too technical. We do not suggest that every electrical salesman should not know the things mentioned, but by far the most important equipment for him is a knowledge of how to capture the business offered in an immense field. As we stated last week, the problems are peculiar to the subject, and require special treatment. If, as the E.D.A. Report states, "as public opinion becomes educated to the desirability of refrigeration, the demand for domestic refrigerating apparatus . . . will increase very rapidly," then the first job is to educate public opinion. Let us tell the salesman how to do this, and help him to do it.

"Consumer's Benefit"

THE term "consumer's benefit" was applied to the provision of the London Electricity Supply Acts of 1925 that any increase of ordinary share dividend above 7 per cent. paid by the companies scheduled should not exceed one-sixth of the amount returned to consumers in reductions in charges below the "standard price" of electricity. The standard price which will be fixed by the Electricity Commissioners as from January 1st, will be based upon the costs of the companies in 1931, checked by the London and Home Counties J.E.A. It will remain in force until 1971, subject to variation at any time by the Commissioners on application being made either by the companies or their consumers. Reductions from the standard price will be applicable broadly to consumers as a whole, and will not necessarily benefit those of any particular class. This may disappoint many lighting consumers in view of suggestions to the contrary that have appeared in the lay Press.

Standard Tendering

TENDERS for machinery can be compared only on a common technical basis, such as that provided by the British Standard Specifications. The primary object of these is to assist British trade, both in the home market and in meeting foreign competition, and their effectiveness is obviously dependent on the extent to which they are adopted. British Standard Specifications are known throughout the world, either by their full name or, more briefly, as "British Standards," and reference to them by initials is not to be commended. As they undergo revision from time to time, engineers and others interested would do well to be sure that the lists from which they work are the most recent publications of the British Standards Institution.

Never Too Late!

HOWEVER assiduously the supply authority pursues the elusive "prospect," there is always a chance that he will turn a deaf ear to the blandishments of the canvasser. But let all authorities take heart, for if they do not succeed during life they may yet secure a *post mortem* triumph—although in this case it will be electricity that will be the consumer. A prominent borough electrical engineer tells us that it is proposed to establish a crematorium in his town, and he has been asked by those responsible whether it would be possible to operate this electrically. We have no doubt that makers of electric furnaces would be able to meet this rather novel application of electricity, and we will gladly pass on their suggestions to our correspondent.

Rural Activities

The results of seven years' work in Cheshire

By S. E. BRITTON, M.I.E.E., M.I.Mech.E.

THE rural area of Chester Corporation comprises 138 sq. miles, with a population of 27,670 (1921 Census), 5,708 occupied dwellings, and 90 parishes. There are approximately 225 miles of public highways along which the population averages 123 and the number of dwellings 25.6 per mile. Supplies were started in 1923 and 1927—the years in which the Special Orders were obtained.

The systems adopted are 6,600-V overhead transmission, and 400-V a.c. four-wire overhead distribution, except in three compact villages where l.p. underground cable is used. The poles carrying transmission lines are on private property, and those carrying distribution are mainly on the roadsides. In the case of the three villages, where the ground is the property of one or two owners, distribution lines are erected at the backs of the houses, with satisfactory results. Some 1,647 poles for high-voltage lines and 3,306 poles for low-voltage lines are in service. The annual rent paid per pole erected on private property is as follows:—In permanent grass and hedges, 1s., and in arable land 2s.

Mr. S. E. Britton, as city electrical engineer of Chester, has been largely responsible for the developments described in this article

Overhead Lines and Sub-stations

Wooden poles have been used hitherto, but experiments carried out this year in conjunction with the Ferro-Concrete Construction Co., Ltd., and Callender's Cable & Construction Co., Ltd., have resulted in the adoption of concrete poles.

Outdoor sub-stations are used throughout the rural area, equipped with 10- or 15-kVA pole-type transformers and high voltage air-break switch fuses for supplies to isolated farms and residences, and 25-kVA ground-type transformers and pole-mounted air-break switches and fuses to supply small villages. Where there are a number of consumers in close proximity, and rural industries, transformers varying in capacity from 50 to 300 kVA, with pole-mounted oil-break switches and fuses or ground cubicles, are employed.

The area occupied by sub-stations is usually about 20 sq. yd., for which an annual rent of between 5s. and 10s. is paid, depending upon the locality.

Charges in Outlying Areas

Supply is now available in parts of 66 parishes and to 2,516 occupied dwellings. The area is divided into two groups

6,600-V transmission: a four-way oil switch

Distribution lines in Christleton village

(*a*) and (*b*) for the purpose of charging, the tariffs being as follows, subject to 5 per cent. discount in respect of items (1) to (4):—

(1) *All Purposes.*—An annual charge equal to (*a*) 15 per cent., and (*b*) 17½ per cent. on the net annual value of the premises, plus (*a*) 0.65d. per kWh and (*b*) 0.75d. per kWh.

(2) *Lighting.*—(*a*) 6d. per kWh and (*b*) 6½d. per kWh. Minimum charges: March and December quarters, 7s. 6d.; June and September quarters, 5s.

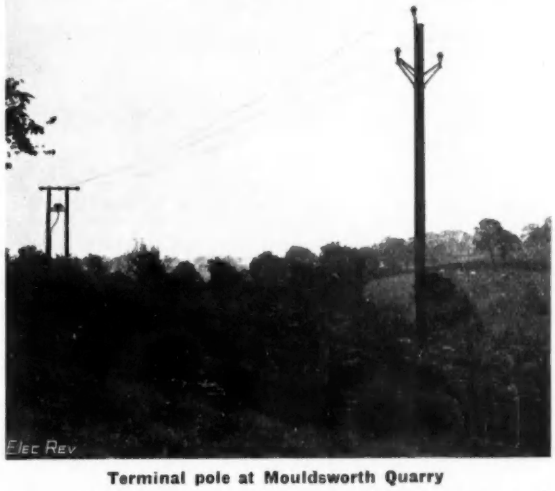
(3) *Industrial Cooking and Heating.*—(*a*) 0.65d. per kWh and (*b*) 0.75d. per kWh for purposes other than lighting or power to industrial and business premises.

(4) *Power* (*kWh per quarter*).—First 250, 2¼d.; second 250, 2d.; third 250, 1¾d.; above 750, 1½d.

(5) *Water Heating* (except between the hours of 3.30 p.m. and 6.30 p.m.): 0.5d. per kWh net.

(6) *Heating Public and Other Large Buildings*: 0.35d. per kWh net.

New consumers are subject to a minimum account for three or five years. The amount charged represents a definite



Terminal pole at Mouldsworth Quarry

number of kWh according to the tariff selected. The basis is a percentage of capital expenditure incurred in transmission and distribution lines and sub-stations to supply a definite village, district or isolated consumer, allocated in proportion to the net annual value, for rating purposes.

The minimum amount is in all cases substantially in excess of the amount which a consumer would pay for lighting only. The annual charge, therefore, places at his disposal a definite quantity of electricity, which can be used for any purpose.

This method has had gratifying results, as it has not only increased the quantity of electricity sold but has induced consumers to buy domestic and other electrical apparatus, which they might not otherwise have done for a considerable time, and has therefore hastened the development of the electrical habit.

Rate of Development

The progress made in seven years is shown by the following figures. By the end of the first year 8 miles of h.v. and 11 miles of l.v. lines with 12 sub-stations served 316 consumers (28 per mile of distribution), taking 112,074 kWh, or 352 kWh per consumer. At March 31st last there were 61 miles of h.v. and 87 miles of l.v. lines, 51 sub-stations, and 2,516 consumers (again 28 per mile of distribution), taking 2,457,653 kWh, or 977 kWh per consumer.

D

The results are those obtained at a particular date, and therefore include works recently carried out and little used.

The types of premises occupied by the 2,516 consumers connected to the supply at March last are as follows :—Residences, 1,975; farms, 212; churches, chapels, and schools, 78; institutes and reading rooms, 32; hotels and inns, 45; post offices, 26; shops, 92; trades, 6; industries, 43; offices, banks, and police stations, 7.

Four village gas-works, 55 oil-, gas-, and steam-driven plants, and four horse jennys have been discarded in favour of electricity. In the following examples particulars are given of annual income derived from country consumers :—

Farms, mainly dairy, acreages from 122 to 346, £25 to £63 (two farms with acreages of 250 and 347 yield a revenue of about £117 each).

Large residences (over 10,000 kWh p.a.), £73 to £740.

Small-holdings, £6 to £19.

Poultry farms, £5 to £101.

Hotels and inns, £18 to £29.

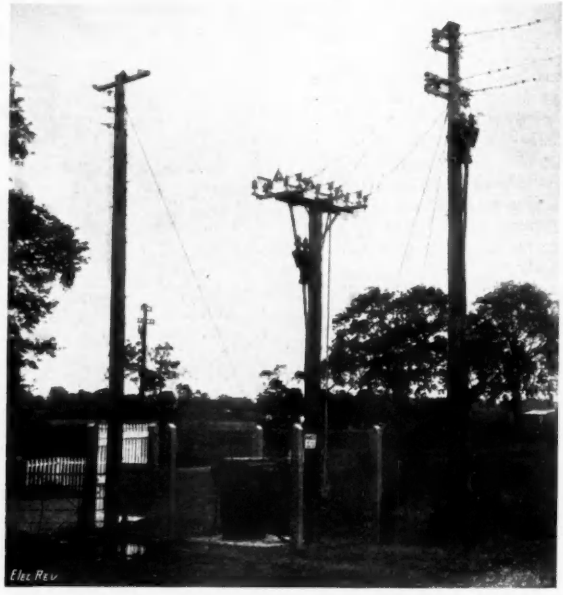
Small residences and cottages, £6 to £20.

Four-roomed cottages with hired cookers, £3 to £6.

Millers and bakers, £19 to £160.

Schools, churches and chapels, £2 to £17.

Grocers and general dealers, £10 to £36.



One of the first 50-kVA sub-stations (Mollington village)

During the last twelve months consumers in the rural area have purchased from the Corporation showrooms 92 electric fires; 25 tubular heater installations; 55 kettles; 28 vacuum cleaners; 58 irons; 15 water heaters; 30 smaller pieces of apparatus, and 16 motors aggregating 114 h.p. There have also been supplied on hire 103 cookers and 12 " cookerettes."

" Personal " Propaganda

Propaganda does not take the form of intensive distribution of printed matter. This system can be adopted successfully in the towns, but the country folk like someone to talk to and something to talk about, and time and money spent by the undertaking in demonstrating apparatus and developing new uses of electricity on the premises of a consumer, without any obligation on his part, have proved an effective form of publicity, and the most lasting form of direct advertising.

Helpful indirect advertising is produced by enthusiastic consumers—and there are many in the area—who, unwittingly by conversation with their friends and neighbours upon the merits of their electrical equipment and their enterprise and wisdom in embarking upon the use of electricity, are valuable unpaid agents of the undertaking; no time and expense is spared in fostering this type of consumer.

The extensive showroom recently reopened is a material asset to the undertaking in attracting new business. Facilities for payment of accounts there, and a continuous system of meter reading and rendering of accounts, brings each day a number of consumers and their friends into the premises. The greatest number of accounts paid in one day was 562.

These arrangements are effective in educating the public in the use of electricity and in obtaining new consumers.

A Chinese Supply Scheme

Proposed reorganisation of facilities in the Canton delta

THE Canton delta has an area of about 3,000 sq. miles and a population of eight millions. The whole area is interconnected by numerous waterways, providing ample transport facilities. At present there are 34 electric power stations in Kwangtung, exclusive of one in Hongkong, one in Kowloon, and one in Macao, and they have a combined capacity of 31,000 kW, or 6 per cent. of the total installed capacity of China.

The stations are grouped in zones with Canton as the hub, there being eight within the 25-mile zone with a combined capacity of 21,750 kW, or 70 per cent. of the total capacity of the whole province. Within the 50-mile zone there are 18 stations with a combined capacity of 25,330 kW, or 82 per cent. of the total, all being on the south-western side of Canton.

According to Mr. Y. M. Chu, A.I.E.E., engineer of the Kwantung Electric Supply Co., Ltd., most of the generating stations are heavily overloaded, and the service is consequently unsatisfactory. In the *Far Eastern Review* he expresses the opinion that the installed plant capacity should be increased by from 50 to 300 per cent. immediately, the total requirement for the 75-mile zone being estimated to reach 80,000 kW by the end of 1940.

Existing Plant

Nearly all of the stations generate at 2,200 V, 60 cycles, three-phase. The distribution systems are two- or three-wire and operate at 220 and 110 V.

A wide variety of prime movers is at present in operation, the most favoured being: (*a*) Diesel oil engines, (*b*) coal producer gas engines, (*c*) steam turbines, (*d*) steam engines, and (*e*) various combinations of these. A large number of the stations were erected between 1910 and 1920, some being badly situated. Equipment was purchased without due consideration of suitability, which has resulted in excessively high operating and maintenance costs. Combining these unfavourable conditions with the rising cost of labour, fuel, and materials, the author considers that the majority of the stations can hardly survive, due on the one hand to a gradual increase in the load and on the other to inability to obtain necessary funds for improvements and extensions.

Proposed Modernisation

With a view to assisting these operating stations in the Kwangtung Province, especially those in the Canton delta, to give the public satisfactory, reliable, and economical service, and at the same time promote the development and modernisation of the various towns, it is proposed to build a new steam-operated station in, or near, Canton City with an initial generating capacity of 50,000 kW and to erect a high-voltage transmission line from Canton through Fatshan, Lock Tsung, and Chan Chuen to Tai Leung (Shun Tak). When the demand increases and the return on the investment has been guaranteed the line can be extended to Yung Ki, Siu Lam, Kongmoon, and Sun Hui.

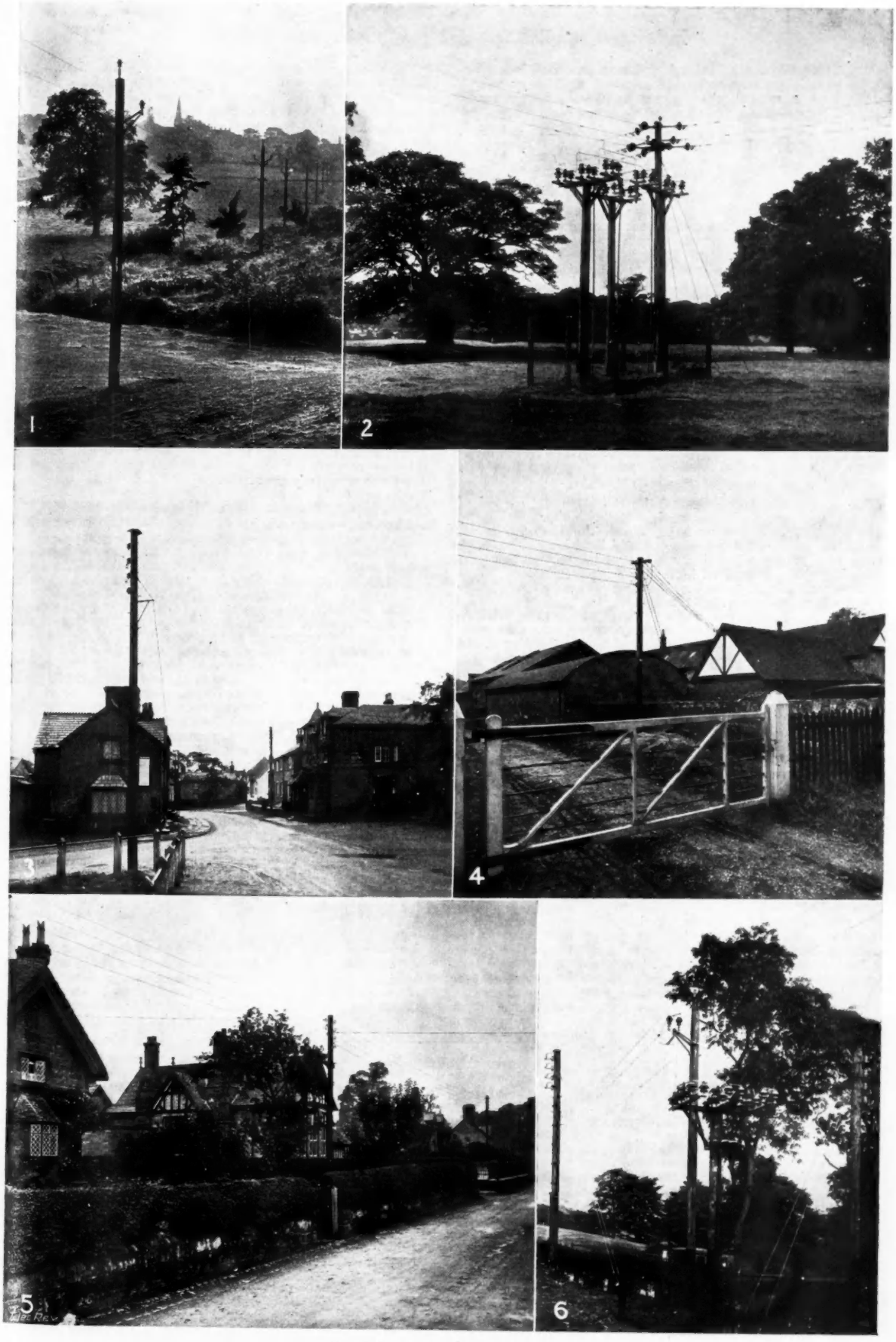
Other lines can also be erected to link all the existing stations within the 75-mile zone. Subsequently, for further extensions, the linked-up power plant can be replaced by sub-stations and part of their equipment transferred to other power stations in the province beyond the 75-mile zone. The projected transmission line would be of 25,000-kVA capacity and designed with a factor of safety ample to meet the severe weather conditions in the locality.

Water Power

There are many suitable sites in the province where hydro-electric plant could be installed. The principal one is the Yung River project. Some 15 years ago it was estimated that a certain site would develop 20,000 kW. Last year the author was requested to join the Government party which made an inspection trip along that river to investigate it. After careful study and consideration he selected a site about 10 miles below the one formerly chosen and estimated the available power to be 10,000 kW (minimum) during dry, and 60,000 kW (maximum) during rainy, seasons.

The present installed capacity of the Canton station is 16,000 kW in steam turbines, 700 kW in Diesel engines in operation, and 2,000 kW in Diesels in course of erection, making the total 18,700 kW. As an alternative it has been suggested that this station should be enlarged by the addition of a 15,000-kW steam turbine and that the Yung River hydro-electric station should have an initial capacity of 20,000 kW. It is proposed that the hydro-electric plant should be operated as a base-load station, the Canton plant being used as a peak-load and stand-by station. Due to financial difficulties and unfavourable local conditions, it is probable that this alternative scheme may not be considered for the time being.

The method of carrying out the work outlined above is to induce all the electric light and power companies in the province to form an associated company, or to organise a holding company to buy up, or gradually absorb, the small concerns. The author believes that this can be easily accomplished by the newly formed Electrical Industry Association of Kwangtung Province, since most of the companies are members of that Association and at the present are struggling hard for existence.



In the Chester Rural Area

1. Run of standard construction straight-line poles, Tarvin-Mouldsworth. 2. Three-way open-air switch, 6,600-V transmission. 3. L.p. lines in Christleton. 4. Service to the Home Farm, Aldford. 5. Distribution lines in Aldford. 6. Standard construction of road-crossing poles and sub-station, Mouldsworth.

The Electric Eye. By C. H. S. Tupholme

Industrial applications of the photo-electric cell

CONSTANT watch is being kept on the industrial possibilities of the photo-electric cell, and the successful application of this device to a variety of industrial needs is evidence that there is a considerable future for the cell, particularly for the control of machinery, and also for recording the progress and efficiency of processes.

One of its first applications was to the checking of combustion conditions in power plant, the principle in this case being based on the fact that the appearance of the gases passing up a chimney are a fairly reliable indication of the efficiency of the stoking and the nature of the air supply. A lamp on one side throws a ray of light through the stack and the flue gases on to a photo-electric cell on the other side. The opacity of the gases is measured by the amount of light that gets through, and is indicated by a meter on the boiler-room control board. Smoke detectors and fire alarms operate in a like manner.

In a steel works the covers of fourteen soaking pits are controlled by such cells. These pits extend in a double row and on the wall above them are two lines of photo-cells, one for each pit cover. On the crane are two 10-ft. long lamp boxes, one above the other, which make light contact with the double row of cells. The object of the light troughs is to make it unnecessary for the crane operator to stop exactly over the pits. In practice he stops over the pit and switches on the lamp box for a moment, when the pit cover slides back. He inserts the ingot, momentarily switches on the light again, and the cover recloses. The reverse mode of operation is to interrupt a steady beam of light.

Factory Lighting Control

A most useful application of the cell is to the control of factory lighting. As the daylight fails, either owing to natural darkness, fog, or heavy cloud, the shop lamps are switched on and off again when natural light is restored. With this type of control, which responds more accurately to the varying need for artificial light than human judgment, larger lamps, burning only when needed, can be used to give better works illumination without increasing the cost. In one instance, in two adjacent 8,000-W installations, the hand-controlled section used two and one-third times as much power as the area under cell control during a three-months' test. In another case photo-electric cells so control a 108-kW sign that whenever daylight fails the 4,300 lamps which make up the sign are switched on, though, as a measure of economy, they are switched off by time control between 1 and 6 a.m.

In other applications sheets of paper flying past the cell are automatically counted at the rate of 60 a second, smoke from over-heated electrical machinery turns on carbon dioxide and sounds an alarm, and defective parts are sorted from a moving production line by their own defects; while, in two cases, the doors of automatic lifts hold themselves open while passengers are getting on or off. Fruit and other objects can be sorted according to density of colour, and dog and other races timed with the aid of such cells.

In the Cinema

The use of the cell in talking pictures is too well known to need any comment, though work is continually being done on the application of improved methods of observing and developing the response characteristics of sound-reproducing apparatus. Another application in the cinema world, more recent than the "talkies," is the use of light cells for the automatic adjustment of the screen according to the size of the film being shown. The light reflected from the edge of the screen operates the photo-cells and so long as that part of the screen is lighted the curtains framing the screen are stationary. Should, however, the picture suddenly enlarge, both cells, one on either side of the screen, receive light and operate motor-driven chains which move the curtains, reeling them up like window blinds on rollers. When the picture becomes smaller again the reverse process takes place.

A Traffic Signal System

An application of the photo-electric cell to traffic control has been carried out in America with, it is claimed, good results. At an intersection of the Lincoln Highway with Trenton Avenue in Pennsylvania an automatic traffic light has been installed. The thousand vehicles or so on the main traffic artery find the light at this intersection always green, except when an occasional vehicle on the side street desires to cross. The latter pulls up opposite a post painted yellow on the kerb. In this post is a photo-electric cell on which is trained a beam of light from a small projector on the opposite side of the street. A car stopping between the two intercepts the beam and photo-electrically actuates the traffic light so that red is shown to the traffic on the main road. Cars turning into the side street from the main road have no effect, as the device includes a three to five seconds time delay.

Should there be an unusual flow of traffic in the side street, or should the mechanism get out of order, the traffic light will revert to the regular alternate cycle normally used on traffic lights. The saving in time with the newer system is said to amount to from one-half to three-quarters of the total former "red-light" time on the main road. Where the usual alternating cycle might give the main road 60-second intervals and the side street 15, with cell control the main traffic stream sometimes flows undisturbed for five minutes, whereas cars on the side streets do not have to wait longer than five seconds to get across.

Measurement of Radiation

The photo-electric cell has also been assembled in a portable form for measuring ultra-violet radiation. This portable meter, which measures 9 in. by 11 in. by 12 in., operates from self-contained dry cells. When the cell has received a definite quantity of radiation, there is a snap which is rung up on a counter, so that the intensity of the radiation can be judged by the frequency of the sounds and the total amount received by their number. The indicator measures the quantity or integrates the amount of light over a given period of time. The rays falling on the cell allow a small amount of current to pass through it. This current is proportional to the intensity of the rays. The current through the cell charges a condenser and when the condenser is fully charged it trips a counter. After this impulse operates the counter the condenser is again charged and the operation is repeated. Each impulse measures a definite quantity regardless of the rate of intensity.

Where the ultra-violet ray source is known to be constant the intensity can be determined, or compared with another source, by counting the impulses per minute. A graphic meter is employed that records the impulses from the ultra-violet indicator. In this case a relay is used instead of a counter and each impulse moves up the pen of the recorder. At five or fifteen-minute intervals the pen is automatically reset to zero. This chart is then a continuous graphic record of the impulses that occur in periods of five or fifteen minutes. The graphic meter is mains-operated and gives a continuous record for thirty days. At present it is used for the study of sunlight and of smoke regulation.

The automatic detection of dangerous gases, in coal mines, for instance, also falls within the scope of the "electric eye." A chemical indicator which is continuously subjected to the action of the gas mixture under observation is placed in front of the cell in the direct path of the light ray. The presence of an impurity will modify the optical transparency of the thin-walled vessel, so actuating the photo-cell; quantitive estimation is possible by calibrating the apparatus.

"British Standard"

NOTICES are given in the ELECTRICAL REVIEW from time to time of the issue of new and revised British Standard Specifications, but many engineers and others engaged in the engineering industry are often unaware that a specification even exists for a particular material or apparatus. There are now approximately 400 of these specifications available, over a hundred of which are of direct interest to the electrical industry generally; the majority of the remainder are of indirect interest to certain sections of this industry. A list of those in force may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1.

It is no longer correct to refer to British Standard Specification as "B.E.S.A. Specifications," for the name of the organisation responsible has recently been changed from the British Engineering Standards Association (B.E.S.A.) to the British Standards Institution.

In many instances, the Specifications have been universally adopted throughout our industry, as, for example, those for meters, power cables, motors and generators, and switchgear. There are also a large number of these Specifications which, though not of such a "bread and butter" nature, are equally valuable in their own field. Specifications of direct interest to the electrical industry may be very broadly sectionalised as follows:—Accumulators, cables, cells (primary), control gear, fans, flameproof enclosures, generators, illumination and photometry, instruments (ammeters, voltmeters, &c.), insulating materials (including oils), meters, motors, nomenclature, overhead transmission-line material, prime movers, permanent magnets (testing of), signalling apparatus (railway), switchgear, symbols, telegraph and telephone material, transformers, voltages, wireless apparatus, and accessories for wiring installations.

In many cases a number of Specifications is comprised within one of the above sections, *e.g.*, there are ten Specifications dealing with control gear, six with prime movers, and eight with wiring accessories.

Membership of the British Standards Institution is open to all British subjects and companies, technical and trade associations, and local and public authorities. Such membership carries with it special advantages, among which is the right to receive gratis copies of British Standard Specifications as and when they are published.

Radio Loud Speakers. By N. W. McLachlan, D.Sc., M.I.E.E., F.Inst.P.

Obtaining faithful and realistic reproduction

IN reproducing sound by electro-acoustical devices one of the main considerations is the range over which the apparatus will respond. Although it is possible to obtain substantially uniform magnification from a thermionic-valve amplifier over a wide range, say, of from 40 to 10,000 cycles, the same cannot be said of the average loud speaker. The response range to be covered depends upon what is to be reproduced.

A flute has a comparatively restricted range, and usually the reproduction satisfies the listener, although the higher tones may be weak. The range of a violin is such that the only notes likely to suffer attenuation are the higher harmonics above 3,000 cycles. A pedal organ is difficult to reproduce, since its range is from about 30 to 10,000 cycles, which cannot be covered adequately by a single loud speaker; an amplitude of vibration amounting to inches would be required to reproduce the lowest pedal notes of an organ at full strength with a moving-coil loud speaker. Fortunately for average purposes it is quite unnecessary to do so.

Musical Essentials

The essentials of musical sounds are twofold: (*a*) the energy component, and (*b*) the interpretational or intelligibility component. The energy component conveys the sense of "body," fullness, and balance, whilst the interpretational component imbues the sound with character whereby it can be distinguished from other sounds. The energy of speech and music is conveyed by the frequency band below 500 cycles, whilst the interpretational and intelligibility characteristics reside in the range above that band.

In stating this frequency range for the "energy" component it is not to be assumed that it gives purely the sensation of "loudness." If in the reproduction of an orchestra all frequencies above 500 cycles are removed, the music will not only be meaningless, but the sounds will also be quite weak. This is due to the physiological properties of the

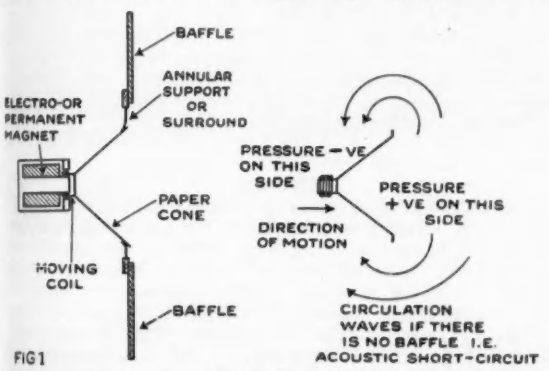


FIG 1

human ear, whose sensitivity declines from 2,000 cycles upwards or downwards. For equal loudness the sound pressure due to a note of 100 cycles is about 200 times that due to a note of 2,000 cycles and, moreover, it has 4×10^4 times the amount of energy. (The ratio varies according to intensity level.)

If the register above 500 cycles is removed in the reproduction of speech, the interpretational characteristics are eliminated and it cannot be understood. To obtain perfectly natural speech it is necessary to cover a frequency band up to about 10,000 cycles. For good broadcast speech a range up to 5,000 cycles is adequate, and for telephonic speech we have to be satisfied with half this range. In other words, speech becomes progressively better and more natural as the frequency range is extended.

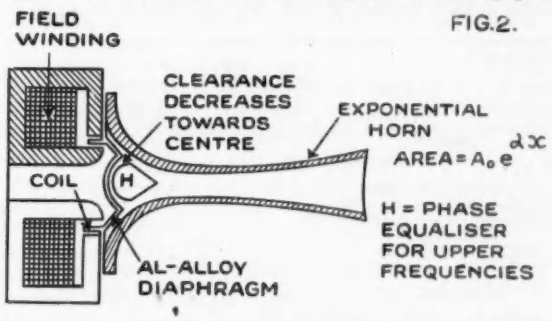
In music a range up to 5,000 cycles (1,200 cycles above the top note on the pianoforte) gives good reproduction. To reproduce transients, such as hand-clapping, coin jingling, paper rustling, pistol shots, &c., adequately it is essential to increase the range to 15,000 cycles or even more. The average moving-coil loud speaker has a range of from 40 to 5,000 cycles, after which attenuation is considerable. It is due to this cut-off and to the natural oscillations of the diaphragm that the above types of transient are never properly reproduced.

Large Diaphragm Model

Quite a number of natural phenomena can be adapted to loud-speaker construction, but few of them adequately fulfil the necessary conditions, namely, fidelity and efficiency. I will describe two salient types of loud speaker in both of which the driving mechanism is a circular coil situated in a strong radial magnetic field.

The reproducing agent in the first type is usually a conical paper diaphragm from 6 to 12 inches in diameter at its periphery, as shown diagrammatically in fig. 1. The coil is centred in the air gap by aid of a spider, or other equivalent device, and the periphery of the diaphragm is supported by a ring of leather, rubber, or other material. During vibration (at any particular portion of a cycle) the variation in air pressure at each side of the diaphragm is of opposite sign, since on one side the pressure is reduced and on the other it is augmented. Consequently, there will be a circulation effect round the diaphragm due to the difference in air pressure. To prevent this acoustic "short-circuit" it is imperative to isolate the two sides of the diaphragm, and this is effected by a flat baffle board. The short-circuit interference effect is negligible

FIG.2.



above 1,000 cycles, but is of paramount importance below 200 cycles, *i.e.*, in the bass register.

If the baffle is removed so also is the lower register. To prevent appreciable reduction at 128 cycles (one octave below middle C on the piano) the distance from centre to centre round the baffle should not be less than half the wavelength of sound. Taking the velocity of sound as 1,120 ft. per sec., the wavelength at 128 cycles is 1,120/128=9 ft. Thus, the side of the baffle (assumed to be square) should not be less than 4 ft. 6 in. In commercial apparatus for domestic use it is customary for appearance sake to use a baffle in the form of a cabinet. This often introduces resonance effects in the lower register.

When talking pictures are concerned such a limitation does not exist and baffles 6 ft. or more square can be used. If the diaphragm system has a powerful resonance in the lower register the baffle can be smaller, and cases have been known in which it was undesirable—as also was the loud speaker!

The "Internal" Diaphragm Type

In the second type of moving-coil loud speaker the diaphragm is wholly within the coil, the latter usually being about 2 inches in diameter (fig. 2). An arrangement like this, even with a baffle, would be highly inefficient, since the area and the permissible amplitude of vibration of the diaphragm are so small. This is a case in which an acoustic transformer is required. Consequently a horn is used in conjunction with the diaphragm to act as a transformer, by means of which the high-pressure low-volume energy in the coupling chamber is converted into low-pressure high-volume energy, which is ultimately communicated to a large amount of air.

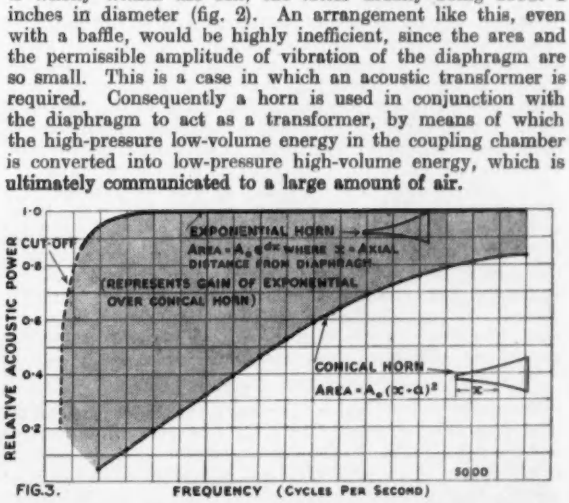


FIG.3.

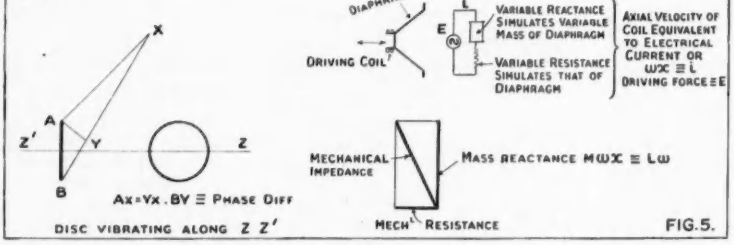
The coil and diaphragm are attached to a flexible annular member which is securely clamped to the magnet carcase. To obtain a high ratio of stiffness to mass an aluminum alloy is used, the diaphragm being shaped accordingly. The natural frequency of the system *in vacuo* with the coil on open circuit is about 400 cycles per second. To get the maximum space factor for the coil, 2-mil aluminium ribbon 15 mils wide is wound on edge and insulated with a lacquer film 1/5 mil thick.

The obstruction H (fig. 2) reduces the throat area or horn entrance to the proper value, thereby enhancing the velocity

of the air particles. Its main function is, however, to act as a phase equaliser. The centre of the diaphragm is farthest from the entrance to the horn. At high frequencies the half wavelength of sound is comparable with the radius of the diaphragm. At 3,200 cycles, for example, the half wavelength is about 1 inch, *so that in the absence of* H if the air velocity were equal over the diaphragm, air particles from the centre would arrive at the periphery half a wavelength late, thereby causing serious interference and a reduction of output. By increasing the clearance between H and the diaphragm from the centre outwards the velocity is decreased and the air particles from various parts of the diaphragm reach the entrance to the horn in substantially the same phase.

Horn Design

The design of the horn is of importance, since it is desired to avoid resonance, to obtain a high efficiency and a wide frequency response. Difficulty is encountered in obtaining the lower register where the wavelength is several feet, *e.g.*, at 50 cycles it exceeds 20 feet. To meet this contingency the rate of expansion of the horn with length should be small. Also, to avoid serious reflection and loss of energy the diameter at the flare or open end should not be less than ¼ the longest wave to be reproduced. This is concomitant with a long horn, and to reproduce the lower register adequately a length of from 15 to 25 feet is required.



The expansion of the horn usually follows an exponential law, as this gives a high acoustic loading. The difference between exponential and conical horns is shown in fig. 3. The horn structure should, of course, have no serious resonances, *i.e.*, it should be "dead" when tapped.

Finding the Ideal Diaphragm

In the early days of sound reproduction by radio broadcasting it was thought that the ideal diaphragm for a hornless loud speaker (fig. 1) ought to move as a whole over the entire frequency range. Some years ago I showed by mathematical analysis that owing to interference of the radiation from the various elemental radiators into which the diaphragm can be divided, the power output above 1,000 cycles decreased very rapidly. Moreover, a rigid structure would be of no use for a hornless loud speaker. This effect can be visualised by aid of fig. 4. If the distance BY is half a wavelength, the radiation from the opposite points of the diaphragm AB—assumed to vibrate along the axis zz'—will cancel out, since the phase difference is 180°. By summing such effects over the diaphragm it can be shown that the sound is propagated as a beam, which becomes progressively narrower as the frequency rises. This can readily be tested on any loud speaker (especially in the open air) by passing one's head from the axis to one side.

The action of the hornless loud speaker depends entirely upon resonances throughout the frequency range. The lower or bass register is due to resonance of the annular supporting ring acting as an auxiliary diaphragm, *i.e.*, it moves between the outer frame and the diaphragm, or to resonance of the diaphragm itself on the annular support or on a centring device. The arrangement in the two latter cases is akin to a mass (the diaphragm) vibrating on a simple coil spring, the mass being driven electromagnetically by the moving coil.

Modes of Vibration

The upper register is due to symmetrical modes of vibration of the diaphragm. The first mode is characterised by the coil and the upper portion of the diaphragm moving in an opposite direction from the lower part; and the second by the upper portion, and that near the periphery, moving oppositely from the central portion. Owing to sound radiation and transmission loss down the diaphragm, the energy reflected from the periphery is less than that propagated from the coil; also there is a phase shift. Moreover, there cannot be any actual nodal circles (complete rest), but merely positions of minimum amplitude.

The second mode of vibration occurs from 2,000 to 3,500 cycles according to the size of the diaphragm, and thereafter the power output is attenuated due to interference and transmission loss.

The reaction on the driving coil consists of two components: (a) in phase or resistive due to sound radiation and transmission loss, and (*b*) wattless or reactive due to the mass of the diaphragm plus an additional air mass arising from divergence of the sound waves from the diaphragm as source. The latter, which is known as the accession to inertia M_1, decreases with increase in frequency above 300 cycles. For a cone 9 in. in diameter, M_1, at 200 cycles, is about half the natural mass of the complete diaphragm. The mass reactance is a considerable proportion of the total mechanical impedance, and it would reduce the amplitude of vibration considerably unless it were offset by the compliance or elasticity of the diaphragm, namely, resonances. A vector diagram illustrating this aspect of the subject and the analogous electrical case is shown in fig. 5.

Efficiency

As in the case of a steam engine, the efficiency of a loud speaker can be stated in a variety of ways. We shall take the ratio η = (acoustic output)/(electrical input). In a hornless loud speaker η depends upon the magnitude of the resonances and the strength of the magnetic field. With a good electromagnet an efficiency of 8 per cent. can be obtained over a certain frequency range. With a permanent magnet as used in apparatus for household reception of broadcast matter the efficiency may lie between 2 and 3 per cent.

When a horn is used the resistive or load component is much larger than in the hornless type. Here it is possible to obtain a much more efficient coupling with the external air since the horn impedance can be designed to suit the diaphragm. This is quite different from the hornless type wherein impedance matching does not occur. The resistive load being much greater in the horn type means that the efficiency is correspondingly enhanced, whilst resonances are more heavily damped. Consequently these instruments are suitable for large output, as in kinemas or public-address work. The efficiency with a suitable horn 15 to 25 feet long is 30 per cent. over a wide frequency range.

With the same input, the reproduction of broadcasting by aid of a well-designed horn loud speaker is louder and better than that from a hornless type. Although the bass register is more powerful in the latter case, resonances are more marked, and higher frequencies often weaker. The latter is concomitant with inferior reproduction of transients, *e.g.*, cymbals and triangles, whose naturalness depends largely on higher frequencies.

Operation

The operation of receivers for domestic purposes is usually effected by a voltage of 200, whereas for public entertainment purposes it is essential to use large valves and voltages of from 600 to 1,000. In speech and music peak values up to several times the mean value often occur. To avoid valve distortion the valves must not be worked to the limit of the linear portions of their characteristics on the average. This is where difficulty is experienced in domestic sets, especially when insensitive loud speakers are used. In an attempt to get a reasonable loudness level the power or output valve is worked beyond its linear limit. On loud passages distortion ensues due to the valve operating on the curved portions of its characteristics and alien frequencies are created.

Although in many households broadcasting is only used as a background to conversation, it is desirable to have a reasonable loudness level to simulate conditions at the studio or in the auditorium. The influence of loudness is related to the physiological properties of the human ear. If we listen close to a band in the park, the fundamental tones of all the instruments from the bass drum upwards are audible. By walking slowly away from the band the fundamental tones become weaker until ultimately the music sounds thin. This is caused by the insensitivity of the ear to low frequencies.

Applying this to domestic conditions, if the Queen's Hall Orchestra were reproduced at a level readily masked by conversation the musical balance would be lost and the orchestral effect travestied.

As a general rule one or more positions in an average room can be found which give the best results. Reproduction is often marred by cabinets which house not only the loud speaker, but the whole electrical receiving apparatus. It is a pity that the horn type of loud speaker—which at the moment is the scientific solution of the problem—is so cumbersome. When building a house, however, there is no reason why a horn structure should not be incorporated within the walls. This could start at any convenient point, and have a bold curve to get the necessary length. The flare, *i.e.*, the opening from which sound issues, suitably camouflaged would occupy an appreciable portion of one of the walls.

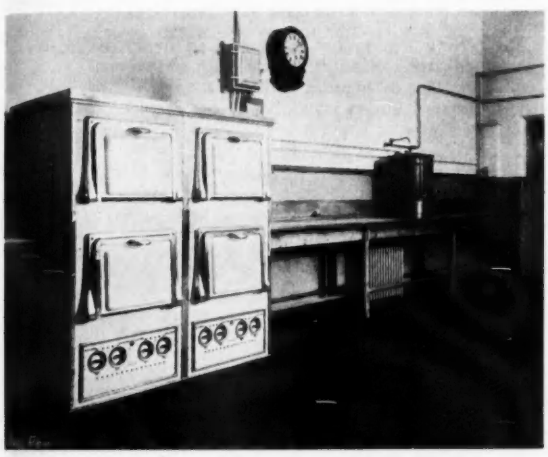
Electricity in a Dublin Hospital. By R. N. Tweedy

Sweepstake proceeds usefully employed

SOME of the first (electrical) fruits of the Irish Hospitals Sweepstakes are to be seen at the Richmond, Whitworth and Harwicke Hospitals in Dublin City. The kitchen equipment of these joint hospitals was antiquated, certainly, but to secure the business was not so simple, because in Dublin electricity is pitted against as well organised a gas opposition as there is in these islands. I am told that the estimates of the gas company both of capital expenditure and working costs were very much lower than the corresponding figures for electrical equipment. Too many victories are won by the gas people at this point, due in part to the credulity of the customer, but in part—and often in greater part—to inexpert salesmanship on the part of the electrical people.

Without really expert salesmanship I believe there would have been no electrical kitchen in this case; I stress this especially because the business was handled by men who are engineers first and salesmen afterwards. They have common sense as well as the special knowledge without which they might have failed to discover the right line of attack.

In the first place they pressed self-contained apparatus at



Four-oven unit and water urn

higher first cost against the island range with hot-plates which would have been necessary to meet the gas proposal on its own grounds; and, secondly, they challenged the gas company's estimate of working costs. They won on both points, because they were prepared to guarantee the working costs, whereas, I understand, the gas company found that course inadvisable.

The installation has been in full use since September, 1931, and the actual working cost is coming out considerably below the guaranteed figure. The kitchen is worked up to its rated capacity of 600 patients and a staff of 70 or 80, and the consumption, carefully checked over long periods, comes out at 0.23 kWh per head per day.

The rate of charge is that common to similar consumers in Dublin, namely 0.75d.—now, alas, plus 12½ per cent.—say 0.85d. per kWh. If it had been merely a question of equalling the cost of working the old coal-fired range, whilst giving the benefits inherent in electrical working, 2½d. could have been charged.

The Heating System

Another notable win for electricity was gained in this hospital, and there again the expert engineer-salesman came into his own. The hot-water service and central heating of the students' quarters was almost as a matter of course going to be done by coal-, gas- or oil-fired boilers, the last-named system being the hottest favourite. A casual inquiry at the Dublin showrooms of the Electricity Supply Board sent the engineers hot-foot after the big job. The upshot of it was that the hospital has been saved a great deal of annoyance and expense through not having to install furnaces and stacks, calorifiers, &c.

The present installation consists of a Mascarini 100-kW (350,000 B.th.u. per hour) 3-phase electrode boiler, feeding radiators on three floors, controlled by a thermostat and a time-switch, the latter being required because supply is cut off between the hours of 4 p.m. and 6 p.m. to avoid the peak. Hot-water service in these quarters is provided by six "Sadia" heaters having a total capacity of 182 gal., and an aggregate loading of 11 kW. These heaters are arranged in batteries situated at various points in the building to obtain the greatest reduction of radiation losses, as the economy of electric water heating turns largely upon this factor.

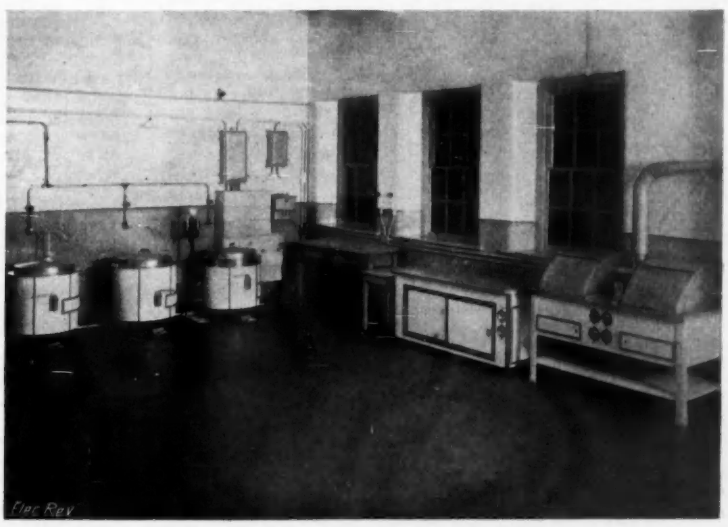
The water heater thermostats are set for an upper temperature limit of 195 deg. F., and the Mascarini boiler runs at temperatures ranging, according to the weather, from 180 deg F. downwards in order to maintain an air temperature of 60 deg. F. in the rooms. The heat-storage capacity of the extremely substantial walls is calculated to carry over the prohibited two hours without discomfort to the occupants of the rooms. The great thing, probably, is to prevent their knowing about it!

Every sales engineer ought to spend a week or so in a state of nervous collapse in a hospital where the heating and cooking are done by coal-fired apparatus, for he would be able thereafter to talk to hospital "prospects," from a new and convincing aspect, of the advantages of electricity as the silent medium.

Equipment in the Kitchen

The connected load in the kitchen of this 600-patient hospital totals 92 kW, made up as follows:—Grill, 9.0; fish-frier, 15.0; hot cupboard, 5.5; 22½-gal. stock pot, 12.5; 16½-gal. stock pot, 7.0; 16½-gal. stockpot, water-jacketed, 8.0; urn, 7.0; and four-compartment oven, 28.0 kW. The grill is 24 in. wide by 20 in. deep by 12 in. high. It has distinct heating panels for the front and back halves of the top, each panel having three-heat regulation with built-in switches. In this, as in all the other pieces of apparatus in this kitchen, the heat control is obtained by phase switching instead of by the series-parallel methods generally used by British manufacturers. Designs have been improved so much of late that there is no reason why two and three phases should not be taken into even moderately loaded fixed apparatus in order to obtain the best heat distribution on the first and second switch positions.

The fish-frier consists of two pans, each 18 in. wide by 18 in. long by 10 in. deep, fitted with hood and flue, exhausting into the same vent as the grill. Each pan is loaded to 7.5 kW and is controlled on the three phases by built-in switches. Groundnut oil permitting a working temperature up to 450 deg. F. is found by Miss Traynor, the kitchen superintendent, to be the most satisfactory medium for deep frying. After a short time at full heat the frying temperature is maintained indefinitely on one phase, that is to say at one-third heat. The hot cupboard is 6 ft. long by 2 ft. 8 in. wide, square, with a plain tinned top having raised edges. A bainmarie top is unnecessary, as the one big meal of the day is served at a fixed time, quite unlike conditions in a hotel or restaurant.



Fish-frier, hot cupboard, and three stock pots

The cupboard is loaded at 4 kW on two phases with two-heat control, and the hot top at 1.5 kW, also on two phases.

The 16½-gal. stock pot has a well-insulated wrought-iron shell with inner pan of heavily tinned w.i. fitted with bottom heating of 7.0 kW maximum loading on three phases. The elements are easily accessible, and the pot can be thoroughly cleaned. The 22½-gal. pot is of the same general design

as the foregoing, but has both bottom and side-wall heating, the bottom elements being loaded at 6 kW, and the side elements at 6.5 kW, each having three-step control by phasing.

The 16½-gal. stock pot is jacketed, so that it can be used for cooking cereals such as rice, sago and porridge. Both the inner and outer pans are made of cast iron, the inner pan being planished and heavily tinned. The bottom thickness is 12 mm., and the side 10 mm. The elements are fitted within the water jacket, and can be removed easily. A nickel-alloy drain cock is provided for the pot, and drain and test cocks for the jacket. As this is a pressure vessel a weight-loaded safety valve and pressure gauge are fitted. The working pressure is about 8 lb. per sq. in. The loading of the elements is 8 kW on three-phase regulation. The urn has a capacity of 15½ gal. It is bottom heated on two phases with three-heat control, the maximum loading being 7 kW.

Roasting and Baking

The oven is a four compartment two-high roasting and baking unit. Each oven is 20 in. wide by 30 in. deep by 14 in. high, and is fitted with a heavy c.i. sole. Top and bottom heating is used, the top elements having a loading of 3 kW, and the bottom elements 4 kW, each being controlled on three phases. The switches are flush mounted. Each oven has a heavily insulated balanced drop door. Roasting temperature is attained in about 35 min. from cold, and it is noteworthy that thermometers are not fitted, all cooking being done to a "time-weight" schedule, with variations depending upon the temperament and experience of the operator.

Results obtained from the apparatus in this extraordinarily simple, but entirely adequate, electric kitchen are such that the kitchen superintendent, who has had practical experience in large establishments with coal and with gas cooking, told me that there is not one solitary point at which either of those systems can equal the equipment with which she is working at present. She confirms once more the old and well-established claim for electricity that it saves heavily on shrinkage, and that the meat is more palatable and more digestible than when cooked by any other means. The morale of the kitchen staff and the quality of the meals served must have improved enormously since the filth-making inferno of a coal range was replaced by a huge but harmless table.

Dirt and Odours Banished

I arrived, to the intense but tactfully concealed disgust of Miss Traynor, immediately after the patients' dinner had been served, and no better testimonial can be given for the easy working of an electric kitchen than to say that within ten minutes no one could have known that the kitchen had been in use that day. There was no dirt on the floors, tables, walls and ceiling, no burnt-in grease stains on the cooking apparatus, and no smell—except what came in from the un-electrified scullery and vegetable steaming room, where the E.S.B. should have no difficulty in persuading the Hospital Board to install an electric exhaust fan, even if they will not go so far as an electric dish-washer.

The whole of the kitchen equipment was made by Senkingwerke A.-G., Hildesheim, and was installed by the Electricity Supply Board. The makers have paid especial attention to the conservation of heat, and they have incorporated in the griller, fryer, and ovens a novel form of slab insulation which seems to be highly efficient.

The wiring throughout is carried in heavy-gauge screwed galvanised steel conduit, electrically continuous with the frames of all the apparatus. The three stock-pots are controlled from a single switchboard fitted with "Zed" fuses and pilot lamps.

I am indebted to the Energy Sales Department of the Electricity Supply Board for its courtesy in enabling me to prepare and to illustrate this article.

Scientific and Industrial Research

THE sixteenth annual report of the Committee of the Privy Council for Scientific and Industrial Research for 1930-31 (H.M. Stationery Office, Cmd. 3989, price 3s. net) shows that to balance the budget the Department's expenditure had to be curtailed in some directions. It is reassuring to learn, however, that the economies effected will not seriously impair the Department's usefulness.

The available funds have been devoted to work of immediate practical value, leaving for happier times such investigations as will not become more or less immediately productive. The net expenditure from the Parliamentary vote was £466,534 and that from the "Million Fund" £89,157, a total of £555,691, an increase of £18,945 on the preceding year.

Patents

Twenty-six British patents were applied for during the year, and ten British and foreign patents or applications were abandoned or allowed to lapse. The subject matter of the new applications includes processes for protecting magnesium against corrosion, apparatus for measuring the intensity of smoke, sunshine recorders, improvements in oscillating pivots, sound recorders and reproducers, separators for coal dust, new plastic masses, methods of treating aluminium and its alloys, methods of treating coal, processes for producing green patina on copper, electromagnetic compasses, and improvements in woodworking machines. Licences have been granted in connection with the anodic process for the protection of aluminium against corrosion and in connection with the linear time base for cathode-ray oscillographs.

Contact With Industry

Grants have been made to research associations by the Department from a sum of one million pounds voted by Parliament in 1917. The total sum so disbursed up to March 31st last was £868,000 against which industry had contributed about £1,250,000. It is the policy of the Department that each research association should ultimately become a self-supporting organisation maintained by the industry or industries benefited, and these bodies enjoy full responsibility for the discharge of their functions. It is not an uncommon thing to find that a considerable part of the time of the staff of a research association is occupied in work for the firms which constitute it and in visits to works.

A noticeable feature during the past year has been a wide recognition of the necessity to give increasing attention to the day-to-day problems encountered by firms in their ordinary processes of manufacture. Some remarkable results, bringing substantial financial benefits to the industry concerned, have already been achieved and it is quite possible that the efforts of these bodies may at any time lead to the rapid development of a promising new industry, or to the successful reorganisation of an existing industry through the use of new or improved materials or processes of manufacture. The outstanding difficulty is, however, still that of bringing home to their members the practical significance of the conclusions arrived at.

Some associations have reached the conclusion that it is necessary to erect complete industrial plant embodying the results of their laboratory and small-scale researches before member-firms can evaluate their worth or can appreciate the significance of their adoption in industrial practice. But research on the industrial scale is beyond the present means of most associations. Even, however, when the advantages of a particular result have been demonstrated there is frequently considerable delay before the new idea is exploited.

A large part of the report is devoted to a summary of work carried out, including that of the National Physical Laboratory, that on buildings (welded steel structures), electro-disposition, radio, illumination, and X-ray crystal analysis; and that of the British Electrical and Allied Industries Research Association and the British Scientific Instrument Research Association.

An All-electric School

THE advantages of radiant heating are especially marked in enclosures where the proportion of glass and the amount of ventilation are very high; the intensity of radiation must, however, be kept constant within reasonable limits. Electricity provides the most convenient and flexible medium for radiant heating, a good example of which is the installation recently carried out at the all-electric Deansbrook Lane School of the Hendon Education Authority by Messrs. Barlow Bros. & Co., to the instructions of the engineer and surveyor, Mr. A. O. Knight, M.Inst.C.E. The architect was Mr. E. A. Yeates.

There are eight class-rooms accommodating 440 scholars; each room is approximately 22 ft. 6 in. by 21 ft. 6 in. by 11 ft. in height, and is heated by "Morganite" 1½-kW panel radiators, supplied by Messrs. Barker, Young & Co., Ltd. The heating panels are fixed between seven and eight feet from the floor. The class-rooms, which form four sides of a square enclosing a playground, have sliding doors which have been kept wide open on mild November days. The headmaster, Mr. W. Hay, who was most enthusiastic regarding the success of the electric heating, informed us that even on a cold December day it has been found possible to keep the windows well open, as the state of comfort in any part of the room is constant under all conditions.

The same constancy is obtained in the assembly hall, which is long and narrow, by means of panels installed on the walls at suitable angles. All the panels are controlled by "Morganite" radiator thermostats, or "Eupatheostats," one of which is placed in each room on the master's desk, according to the state of comfort as defined by radiation and convection. The installation is switched on for an average period of one hour before the school is opened in the morning, the appropriate time being notified to the caretaker by means of a switching indicator operated by one of the class-room "Eupatheostats."

In the cloakrooms, "Unity" tubular heaters are fixed beneath the clothes racks. In the staff room there is a "Belling" fire and also a cooker of the same make, and in the headmaster's room another "Belling" fire.

These Discounts. By Vanadis

The author, a motor sales director, discusses a knotty problem

IN the "Classified Index to Advertisements" in a recent issue of the ELECTRICAL REVIEW there are listed under 200 headings various trades, articles and services used by the electrical and allied industries. Of these 200, 80 are either raw materials or partly finished articles not subject to resale, *e.g.*, boiler coverings, or services, *e.g.*, factory agents. One hundred and nineteen are fully manufactured articles subject to resale and in general use either by the non-technical public or as equipment by various non-electrical trades, and one heading "Accessories" has not been classified, owing to its vagueness.

Of the 119 "resale" headings, 113 deal with articles which can only be bought by the actual user at the makers' full list price; in other words, over 95 per cent. of the industry, as judged from the advertisements in its most widely read paper, the resellers of goods, are fully protected.

The remaining six headings deal with motors, dynamos, small converters, starters, battery-charging boards, and hack-saw blades. As regards the last two items, I am open to correction, but in the case of the other four—all of which are made by one branch of the industry—the user is perfectly able to buy at the same price as anyone else. Large alternators and power station plant are excluded from the "resale" classification, and this statement refers to motors of the smaller sizes which are part of the equipment of every factory and are frequently built into machines of various kinds. Moreover, the smaller the motor the more strongly does the statement apply.

Some views of the Deansbrook Lane, Hendon, all-electric school (*See opposite page*)

There is, of course, very keen competition among the makers of such motors, and prices have been cut to the lowest possible figure in order to sell against imported machines. No suggestion of dumping is made; the foreign importers are able to sell at a low figure by reason of their much larger factories. This competition against the imported motor has developed into internal competition among the English manufacturers which, in itself, is not a bad thing. The real evil that has arisen out of this internal competition is that, to get orders, motors are sold to all and sundry at any price that can be obtained. Manufacturers issue price lists, arrange systems of discounts—so much off for the wholesale buyer, so much for the retailer—and then send out their travellers with instructions to allow wholesale discounts, if necessary, to the actual users of the machines.

A Dutch Auction

Thus the selling of motors, and especially of small motors, has degenerated into a sort of Dutch auction. If a printer, or a laundry owner, or a beer bottler, needs a motor, he sends out half a dozen inquiries. When manufacturer A follows up his list price quotation, he is told that B has quoted a 15 per cent. discount. In self-defence he also offers a discount. On following this up he is told that C has offered a 25 per cent. discount.

As a result the firm which gets the order has to make, and frequently install, a single motor at a price no higher than it would get for a dozen machines, while the sales costs are probably large enough to swallow up the profits two or three times over.

The ridiculous side of the whole business is that the buyer would be perfectly willing to pay list price for the machine if he knew that he could not get a discount. No buyer minds paying the retail list price for a wireless set, or a motor car, or a switch, or a lamp, simply because he has been trained to pay it. Why then should motor manufacturers throw their money away in order to spite their competitors?

This is only the beginning of the trouble. There is in this country a large and fairly well organised system of electrical wholesale and retail trading, the members of which live by dealing in wire, lamps, switches, shades, and similar articles. Not many of the wholesale houses deal in electric motors, and, of those that do, very few will touch British-made motors. The reason is not far to seek. What wholesaler can be expected to deal in the goods of a manufacturer who will undersell him behind his back if he possibly can? The wholesaler, who has to make a living, can hardly be blamed for taking a sole agency for a foreign motor where profit is secure.

Training the Wholesaler

I hold no brief for the wholesale factor. He has an unpleasant habit of insisting on quantity prices for single motors, and then expecting the manufacturer to carry his stocks for him. But he could probably be trained out of this. He has to carry stocks of foreign motors, and he has to buy them in quantities, and he would very soon do the same with English motors if he could rely on his discounts being protected.

This is not the whole story, by a long way. Far more small motors are sold to makers of, and dealers in, the innumerable kinds of light machinery than will ever be sold through the electrical trade; and the largest market is entitled to buy at the lowest price. Also, the impression has been given that all motor manufacturers are rogues and cut-throats with no business morals whatever, which is not true; at least, not invariably true.

But if my accusation of folly has the effect of rousing any of my competitors to the point of discussing the matter, or, better still, of coming together to work out a discount scheme, these other points can easily be arranged.

Every other trade in the industry has such a scheme, and it is not a matter which presents any real difficulties. No one could have any reason to complain if one were introduced, and the trade would not lose a single order. In the long run the motor manufacturers would gain immensely by having the distributing trades on their side, instead of against them as at present.

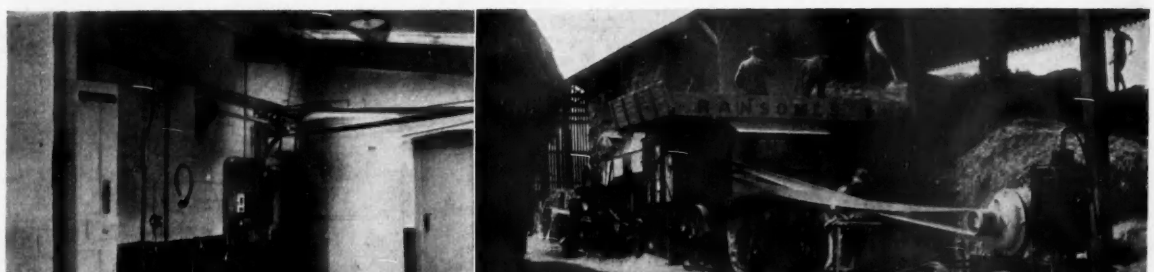
The Contractor's Store. By H. R. Taunton

Overstocking and its dire results

THE electrical contractor's store might be idealised as a perfect vacuum, a non-existence with nothing in it. The nearer it approaches that ideal the firmer the foundations of his business; or, to put it picturesquely, the emptier his basement—the usual locale of his store—the sounder the roof over his head. Overstocking, with its attendant evils of depreciation and obsolescence, has probably brought more firms to ruin than any other of the calamities which dog the hard way of the contractor.

Not long ago a certain firm, which, shortly after the war, was one of the leaders in the industry, was forced by circumstances, which included a new broom of a managing director, to reduce drastically a stock which had figured in its balance sheets for years at something like £12,000. It was costing it, at a fair computation, about £1,000 a year in standing charges; rental of space, upkeep, staff salaries, and clerical work. It was decided, wisely and courageously, to get rid of ninety per cent. of it, at whatever sacrifice.

The unwanted stuff was extensively advertised and hawked round the trade, and in the end the bulk of it was sold on terms as favourable as could be expected, comparatively little being thrown away in the auction room. And what a balance sheet had pretended was worth nearly £12,000 proved to have a market value of less than £600. Few firms could have survived such a set-back, as happily this one did. It has not yet regained its old prestige, but at least it is not living in a fool's paradise, as are so many others who fear to scratch the surface value of their stock lest they find it covers little more than scrap iron and rotting junk.



Rural Activities at Chester (*See pp. 111-113*): **A 300-gal. water heater and a wash-boiler in a dairy. Thrashing and straw baling at Deeside Farm, Sealand**

Keep It Down!

The golden rule of the electrical contractor's store, then, is to keep it as small as possible. It should contain no more than is essential to the convenient working of his business, in particular the jobbing side of it. A watchful eye should be kept on it to prevent it becoming permanently swollen by over-ordering for, and consequent returns from, contracts. What its maximum limit should be depends on the nature of the work customarily undertaken by the firm, and the conveniences available in the shape of local suppliers and wholesale factors. For example, a contractor isolated in a small country town may have to carry a larger stock of lamps than one who can step into the next street and buy them as he wants them from a wholesaler.

In normal circumstances most firms ought to be able to keep their stock down to one per cent. of their annual turnover. If they can manage with less, so much the better. They should aim at something like half per cent.; and, if their standard work is no more than ordinary wiring and jobbing, and if they are in a position to obtain material readily from local suppliers, there is no reason why they should not, by taking a little pains, get down to that figure.

The disadvantages of an unnecessarily large stock are many, and most of them are obvious. There is the extra space required, which entails extra lighting and heating and expenses in maintenance. There is the extra staff needed, in the store itself and in the office, not only for handling the stock but for booking it in and out, listing and pricing it. The mere volume and complexity of the material involves delays and difficulties in finding what is wanted and disposing of what is not, however thorough the system on which it is handled—and if the system falls short of thoroughness, it involves chaos. There is the point, too, of loss of interest on dormant, not to say dead, capital. Whatever is in the store has presumably been paid for, but until, if ever, it is used it is bringing in no return. All these are direct increases of standing charges, entailing a reduced margin of profit on work of a competitive nature.

Depreciation and Obsolescence

Less obvious, and not so commonly taken into consideration in the annual balance sheet as they should be, are the losses from depreciation and obsolescence. Once perfectly sound stock, carefully stored away from damage in dust-proof cases, may yet by the lapse of a few years become worthless through the introduction of improved patterns, while it figures all the time in the stock list at its original cost. How many of the accessories of ten years ago, or even five years ago, would be accepted as standard to-day by a consulting engineer?

Depreciation is of two kinds. There is the natural depreciation, the slight damage due to atmospheric conditions, and to continual handling, particularly marked in the case of items sent out to contracts and returned as surplus: rusting, tarnishing, scratching and chipping. And there is the depreciation due to altered market conditions. Material bought for stock yesterday becomes automatically of less value by a reduction in to-day's price made by the suppliers. And, finally, there is actual loss: reductions in actual quantities due to breakages and all sorts of mysterious causes, despite the most elaborate checking.

Of course all these diminutions of value affect the small stock as well as the large one; but even if the proportion were the same the total loss is in the latter case so much the larger. But the proportion is also usually larger, as any increase of volume beyond working needs means a less frequent turning over of stock, involving obsolescence, and a greater liability of a breakdown of a proper system of handling the goods, so that they are more subject to deterioration, damage, and leakage.

The Manageable Minimum

The advantages of a small store follow as the converse of the above and need hardly be enlarged upon. Kept to manageable limits, the storekeeper has everything in hand-reach, almost in his memory, easily and quickly handled, without confusion and the risk of duplication by unnecessary new orders. The stock is more quickly turned over and goods are less likely to be overlooked and left unsold until they become obsolete.

It is needless to stress the point farther. Keep the stock down to the lowest practicable limits and keep it moving, up to date. Everyone will agree that this is an axiom of sound business. Unfortunately stock has a way of taking the bit between its teeth. A year or so of neglect and it will accumulate and become a seething jumble of unnecessaries, good stuff having its value jostled off by worthless rubbish, the whole a millstone round the neck of the business.

There are two ways of dealing with a millstone. You can cut it loose—and find yourself some day in want of it; or you can mount it on a carrier and trundle it comfortably along with you until you do want it. So with stock. Since you can hardly do without it, the question of how to carry it most easily is the real issue.

That some of us still manage to remain afloat in the perilous seas of modern competition, with income tax at 5*s.* in the £, and a "world crisis" with every morning's marmalade, is evidence enough that there are known ways of keeping it within manageable limits. None should be neglected; all merit the most careful consideration.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

What is Hindering Development ?

AT an informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS (with Mr. M. Whitgift in the chair) on January 11th, Mr. H. T. Young opened a discussion on "The Relative Importance of Energy and Installation Costs as affecting the Sale of Electricity."

Mr. Young said he hoped the meeting would treat the subject as an attempt to discover what it was that hindered the rapid extension of the use of electricity, remembering that owners would not incur the cost of wiring houses when they could let them as they were, while tenants would not pay for installations in houses which they might not permanently occupy. He strongly advocated assisted wiring schemes and referred with warmest approval to the report (reprinted in 1931) on "Assisted Wiring; and Hire-purchase of Electrical Apparatus" by the Committee appointed by the Electricity Commissioners a year or so ago.

One of the peculiar anomalies of electricity supply was that most authorities would pull up roads and incur all the cost of laying mains to districts, but would not put in a rising main for the tenants of large blocks of flats. He dealt with many of the irritating details that often seemed inevitable to a supply of electricity, and said that application forms sent out by supply undertakings were frequently of a type that made an income-tax return simple by comparison, while conditions, references, and meter rents were often vexatious to consumers used to the attentions and service of gas distributors.

Many of his remarks regarding domestic supply applied equally to commercial buildings, but for the bigger consumers a more enlightened spirit was abroad and some of the large London stores, notably in the St. Marylebone area, were admirable examples of electrical development, due largely to considerate conditions of supply.

Architects, in the main, required educating to the economies and advantages of electricity, but there was every prospect that London would soon possess a bureau of architectural development with large-scale exhibits along the lines of the Berlin exhibition, thus affording the electrical industry a splendid chance of doing very necessary propaganda. The bad, or backward, supply undertaking was guided and directed by the Electricity Commissioners; why, therefore, was the jerry wiring contractor left to carry on his depredations unrestrained?

Mr. F. Selley said, with regard to the desire to abolish meter rents, he knew of dwellings and garages that were never accessible to the meter inspector; one case, a garage, being without a meter reading for three years. He agreed in general with Mr. Young's protest at the supply authority's usual attitude to rising mains, but, here again, the problem was not always simple. Many owners of blocks of flats liked to purchase in bulk through a meter and retail the supply to the tenants at a profit. That generally hampered development.

Mr. W. Jones thought the whole question was one of service; there was a tremendous amount of information and service at the disposal of users of gas. He believed many architects were at last really interested in electrical amenities.

The Selling Side of Refrigeration

THE paper on "What every Electrical Salesman should know about Refrigeration," which was presented by Mr. A. G. Clausen at the salesmanship conference of the BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION on January 15th, might almost be described as a technical treatise on refrigeration generally.

The author said that a general knowledge of the principles upon which refrigeration is based and the highly technical, but nevertheless severely practical, research work on refrigeration that is being carried out at the National Physical Laboratory, in conjunction with the low-temperature research laboratory at Cambridge and the Food Investigation Branch of the Department of Scientific and Industrial Research, must prove of the greatest benefit to salesmen.

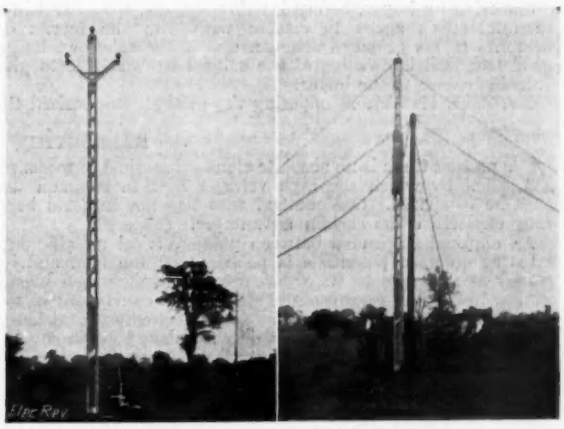
Mr. Clausen explained the operation of the two types of refrigerator, absorption and compression, and said that the most serious difficulty in the development of the compression type in very small units had been the need for more or less constant attention. He had been recently informed that the "dumb-bell" hermetically sealed refrigerator (G.E.C.) was being marketed in sizes suitable for domestic use.

Mr. Clausen did not believe that the small refrigerating machine would be a success without some measure of automatic control, although something might be said for a form of control requiring a few moments' attention for starting and stopping each day.

The difficulties of securing a vacuum for insulating purposes in the smallest domestic refrigerators were mentioned, whilst the troubles associated with the prevention of the movement of air in the insulating space were also referred to. The movement of air in these spaces, however, could be greatly reduced if the insulating space were divided into a number of minute cells, and it was explained how this cellular structure of the insulating space, rather than the nature of the materials themselves, was so valuable in providing insulation.

A refrigerator of 6 cu. ft. capacity required about 1¾ kWh per day, whilst a 10 cu. ft. refrigerator needed about 2¼ kWh.

Answering questions, Mr. Clausen said that small refrigerators had been in operation for five years continuously, and they showed very little sign of depreciation, given reasonable maintenance and attention. It was really too early yet to assign a life to such machines, and, whilst 20 years was given as the term of large machines, he would not be at all surprised if the small domestic machines had only ten years of life.



Concrete poles in the Chester area (*see pages* 111-113)
Line from Farndon to Shocklach — Showing the erection of a pole

Electricity in Newspaper Production

NEWSPAPER production, with particular reference to the applications of electricity to printing works, is the subject of the paper which Mr. A. Kirk read before the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on January 19th.

Duplicate, or alternative, supplies of electricty derived from separate sources are very desirable. Self-contained stand-by plant, consisting of an engine and generator, is neither economical nor efficient, owing to the time required to put it into operation, and high capital and maintenance costs. A stand-by battery on the trickle charge principle, in conjunction with a motor generator, automatically controlled, is the best solution.

In the case of a.c. operated works high capital outlay is necessary, but against this a scheme can be evolved whereby the alternator may be used for power-factor correction, thereby recovering the capital cost.

In calculating the capacity of battery required it is necessary to arrive at the average period of time of supply station failures. From data collected the author is satisfied that twenty minutes is a fair average time to allow for, from cessation to resumption of supply, and this time in the case of a provincial evening newspaper corresponds very nearly to that required for an edition run.

The author has found a considerable difference of opinion amongst supply authorities regarding the method of obtaining the m.d. value and the time over which the m.d. should be taken. An important point when considering what system of tariff shall be adopted is the ratio of lighting to power, and it can be taken as a general rule that the higher the proportion of lighting to power the greater the need to adopt the m.d. system. When the ratio of lighting to power is of the order of 1 to 2 it will probably be found advisable to go on the m.d. rate, depending, of course, upon the relative tariff values.

To improve the load factor in a provincial evening newspaper works it is imperative that the closest co-operation between the electrical staff and the different departments shall be maintained; if the supply is on the m.d. system hundreds of pounds may be saved annually.

THE DISTRIBUTION SYSTEM

The ideal distribution system would be a three-phase four-wire ring main, whereby any required load would be available at any desired point, but there are many almost insuperable difficulties to be overcome in preparing a workable scheme. The usual practice is to bring the supply to a main switch room where all main controls are grouped, and from these distributors are carried to independent motors and distribution boards that in turn control small motors and other current-consuming devices. It would be better if the main

switches were grouped on the same gallery as the control panels for the presses.

The general practice is to keep the power and lighting controls separate, to enable a check to be kept upon the relative current consumptions. This unfortunately prevents the adoption of combined power and lighting distribution, undoubtedly the most economical system so far as wiring costs are concerned, and most convenient and elastic when changes are required. The best method of wiring available for newspaper works is a draw-in system of v.i.r. wires in screwed steel conduit.

The efficient and economical lighting of the working parts of rotary presses is a problem that cannot be standardised, owing to the varying factors dependent upon the configuration of the room and the position, size, and make of press. In all places containing running machinery "pilot lights" should be provided and fed from an entirely separate supply.

TYPE METAL MELTING

The use of electricity for heating is not very evident in provincial newspaper works, but it is gradually spreading, and takes the form of ordinary heating of buildings by radiators, etc., and the melting of type metal in the linotype and "Ludlow" pots and stereo metal in the "autoplate" pots by means of totally enclosed elements immersed in the molten metal with automatic temperature controls of the thermostatic type. It is regrettable that practically the whole of the apparatus for this work is at present imported from America.

A.c. operated newspaper printing works have a great advantage over those equipped with d.c. motors, because the squirrel-cage motor is undoubtedly the most robust type possible to obtain and has the lowest maintenance cost, its only limitation being starting conditions. The usual a.c. single-phase motor is a bugbear on account of its low power factor and high maintenance cost, the latter being largely attributed to the inaccessibility of working parts in cases of even minor mishaps. There is no reason why a three-phase squirrel-cage motor should not be used and fixed in an accessible position. The crux of the matter appears to be in the practice, fairly general in the press world, of allowing the machine makers to supply any motor they think fit.

At the present time a considerable amount of attention and earnest thought are being given to the "unit drive" for rotary presses, and the author feels convinced that it will ultimately be adopted, but he is not sure that variable-speed motors will remain. He can visualise some form of infinitely variable speed mechanical gear driven by electric motors at synchronous speeds and highest efficiencies.

Should Salesmen be Engineers?

AT a meeting of the North-Eastern Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS at Newcast]e-on-Tyne on January 15th, a debate took place on the motion "That it is for the benefit of the engineering industry that the salesman should be an engineer."

Mr. J. Bennett, who led in favour of the motion, said that the salesman-engineer would be a benefit to the manufacturer, purchaser, and to the whole industry. All representatives, agents, counter hands, and estimators should be trained engineers. The salesman, however, who sold vacuum cleaners, radiators, &c., need not have such an extensive technical knowledge as his colleague who sold heavier plant, for his problems were not of such an intricate nature. It was useless sending a salesman to a prospective buyer if he was little more than a commercial traveller who had not made a study of the firm's product.

Sometimes a buyer, before inviting tenders, would call in a manufacturer's agent to discuss with him the merits or demerits of his proposed scheme, and if the salesman had a good technical knowledge of the subject he was able to give valuable advice to the buyer.

Mr. S. G. Hamby, in opposing the motion, emphasised the fact that there was a big gap between having a knowledge of engineering practice and being an engineer. There were three strong reasons why a combined salesman-engineer would not be a success. First, the main personal characteristics required for each job were totally different; secondly, the general attitudes to and outlooks upon life were at variance; and, thirdly, in these days of rapid development, no man without exceptional intelligence could be expected to find time to function to advantage in two different walks of the industry.

Unless it was a very small business wherein a single individual could design a job in the morning and then attempt to sell it in the afternoon, what possible advantage would it be to employ someone who would spend half his time forgetting what he knew of salesmanship while he learned engineering, and the other half forgetting engineering while he was learning salesmanship. The salesman must have tact, patience, and a smart appearance, and those, said Mr. Hamby, were qualities rarely possessed by the engineer.

During the discussion which followed, the majority of the members spoke in favour of Mr. Bennett's motion and on a vote being taken it was decided that it was desirable that the salesman should be an engineer.

Measuring High Voltages

AT present there is no absolute standard method of measurement by which the high voltages now in common use may be compared. One method that has not hitherto been fully explored offers certain advantages.

An ellipsoid suspended between plane vertical metallic surfaces at different potentials is polarised by the field and, if placed at an angle to it, experiences a torque which brings it into line. The magnitude of this torque can be calculated when the material and dimensions of the ellipsoid and the intensity of the undisturbed field are known, and can be observed either by static deflections or by allowing the suspended body to make small swings about a position of rest in line with the field. Measurements made for the purpose of finding the dielectric constants of solid insulators have shown that this method is capable of great accuracy, which depends largely on the perfection of form of the ellipsoids.

At the INSTITUTION OF ELECTRICAL ENGINEERS on January 21st Prof. W. M. Thornton and Mr. W. G. Thompson gave an account of how the polarisation of a metallic ellipsoid of revolution, suspended by an insulating fibre between vertical circular pole-plates, can be observed.

The dimensions and proportions of the ellipsoid and of the horizontal field have been determined with great accuracy and the magnitude of the electric gradient on the axis of symmetry of the instrument calculated for given applied voltages. The working formula of the instrument is $F=k(n^2-n_0^2)^{\frac{1}{2}}$, where F is the field strength, k a constant found from the dimensions, n the number of swings per second of the ellipsoid with the field on and n_0 with it off. The influence of the spacing of the plates, of shielding the ellipsoid, of gas pressure and temperature has been examined and the readings of the instrument were compared with Whitehead and Castellain's sphere-gap determinations of voltage.

As a combined check on the accuracy of their readings and those of this instrument, a value of the ratio c of the electromagnetic to the electrostatic units of quantity has been obtained which agrees with the best previous results. It is concluded that continuous measurements of voltages up to 200 kV can be made with the precautions indicated in the paper, to an accuracy of at least 3 parts in 1,000, the constant of the instrument depending upon the value accepted for the ratio c.

ADVANTAGES OF THE METHOD

The method is suitable only for voltages high enough to maintain a field of several hundreds of volts per cm. at the centre of the space between the plates, while at the same time the ratio of distance between plates to length of the ellipsoid should not be less than 25 if an accuracy above 1 in 1,000 is required. One advantage of such an instrument is that the calculations and working formulæ are simple and involve only measurement of the dimensions of the ellipsoid and of its time of swing or deflection. The mechanical arrangement is also simple, but, if it is to be used as a standard, the instrument must be large. In that described the plates are 140 cm. in diameter and 100 cm. apart.

The ellipsoids used in the previous work were made by Messrs. A. Hilger & Co. with such perfection that optical enlargement to 20 times or more the actual size failed to show a departure from the calculated ellipse of the same axial dimensions to as much as the thickness of a fine pencil line in an image 6 cm. in diameter and 40 cm. long. It is the possibility of being able to rely on such workmanship that gives to the method the first quality of an absolute standard instrument, an exact knowledge of the dimensions of the working part; in the present case this was a duralumin ellipsoid of revolution 0.59 cm. in diameter and 3.9 cm. long.

High-Pressure Electrolysis

THE production of hydrogen and oxygen by electrolysis at high pressures is the subject of the paper which Dr. D. M. Newitt and Dr. H. K. Sen read at a meeting of the INSTITUTION OF CHEMICAL ENGINEERS which was held on January 20th.

Many improvements have been made in the design and construction of electrolytic cells in recent years, and a modern installation, nearly automatic in operation, will run continuously over long periods with little attention; further, it possesses inherent flexibility, and may be considerably overloaded with no other ill-effect than a loss of efficiency. Indeed, when either electrolytic gas is required, or the oxygen, which forms a valuable by-product, can be usefully employed, electrolysis can compete on favourable terms with any of the more extensively used chemical means of producing these gases.

It has recently been shown that definite economies can be realised by carrying out electrolysis in closed systems whereby high pressures are built up and maintained during operation. Apart from any direct gain in energy efficiency there are certain obvious advantages accompanying the use of high pressures. For a given output the storage space required to accommodate the products will vary inversely with the pressure. Moreover, when the gases are subsequently utilised at high pressures the cost of compressors and of compressing is entirely eliminated.

The paper gives some account of the *rôle* played by pressure in modifying the various factors concerned in electrolysis

and describes two cells designed to operate at a pressure of 200 atmospheres.

THE KENSINGTON CELL

One of them was designed for use at the Imperial College of Science and Technology; it is of small capacity, but is capable of operating for long periods continuously without complicated control devices.

The dimensions of the cell are such that when filled with electrolyte to the working level the gas capacities of the cathode and anode chambers are approximately in the ratio 2:1. Small differences in pressure are then automatically compensated for by corresponding alterations in the levels of the electrolyte in the two vessels. When the cell is in operation the level of electrolyte can be maintained by forcing in distilled water through a valve, a hand-operated hydraulic pump being adequate for the purpose.

Such a cell has not a high efficiency owing to its comparatively large internal resistance; but efficiency is not of the first importance, since the principal object is a supply of pure gas at a high pressure. Numerous tests extending over periods of from 5 to 8 hours have yielded, in every instance, gases of upwards of 99.5 per cent. purity. The energy consumption of the cell using 20 per cent. caustic potash as electrolyte is about 10 kWh per cu. metre of gas measured at n.t.p., the increase of pressure on closed circuit being between 5 and 10 atms. per hour. The current density does not exceed 0.5 mA per sq. mm., and is, therefore, below that at which any appreciable saving in energy as the result of pressure could be expected.

THE NOEGERRATH CELL

The only technical high-pressure cell which appears to have been tested at all exhaustively is one designed by Dr. Noegerrath, but full details of its construction have not been disclosed. The hydrogen and oxygen evolved pass upwards through pipes to the storage cylinders and thence to the working cylinders. The pipes are connected through a U-tube, which is partly filled with electrolyte, and, having a relatively large capacity, acts as a compensator for small variations of pressure on the two sides of the cell. There is no other compensating device, and a leak would eventually result either in the transference of electrolyte and a consequent breaking of the electric circuit, or in an admixture of the gases.

A similar unit has been in operation for some years on the German State Railways with satisfactory results. It appears that its specific energy consumption varies, according to the load, from 3 to 3.5 hWh per cu. metre of free gas and it has an output of some 60 cu. metres (2,118 cu. ft.) of free gas per hour, the average purity of which is upwards of 99.5 per cent. When taking a current of 1,500 A there is a fall in voltage from 2.58 at atmospheric pressure to 2.38 at 200 atms. and, if the work required for compressing the gases be included, a drop in energy consumption from 4.35 to 3.55 kWh per cu. metre of free gas. A direct saving of nearly 20 per cent. is therefore obtained as the result of increased pressure.

Warming press, fish frier and grill in the Richmond Hospital, Dublin (*see page* 117)

The I.E.E. President's Optimism

THE annual dinner of the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS was held at the Midland Hotel, Manchester, on Tuesday last.

Mr. H. Moberly, vice-chancellor of the Manchester University, proposed the toast of "The Cities and Trades of Manchester and Salford," and, in the course of his response, Alderman G. Titt, deputy-mayor of Manchester, took up a similar theme to that propounded by Mr. Frank Hodges at the I.E.E. dinner at Cardiff last week. He said that the district could no longer expect to retain a world-wide monopoly for its staple industries and that fact was being realised.

ADAPTATION

The Manchester Development Committee was looking out for opportunities of encouraging the establishment of new, smaller, and diversified trades. By this means it was hopeful of more than regaining its former commercial pre-eminence.

The speaker urged his listeners to keep cheerful in an effort to restore confidence. The present crisis had shown the need for international co-operation.

The health of the Institution was proposed by Mr. B. Mouat Jones, who commended the I.E.E. upon the way in which it maintained the closest relations with scientific research, while continuing to look after the professional well-being of its members. Modern civilisation depended to a great degree upon investigations by scientists without regard to immediate utility.

A GOOD TIME COMING

Replying to the toast, Capt. J. M. Donaldson, the President, congratulated the Centre on securing a record attendance (320) at the dinner. He thought that there was too much talk about the badness of conditions; we needed to gird up our loins and prepare for the trade revival which would come when confidence and demand were restored. Present stocks would not meet that demand when it came.

Supply engineers should make up for the reduction in the industrial load by cultivating the domestic consumer, while manufacturers should be overhauling their organisations to be in a position to meet the rush of orders which would come.

The North-Western Centre was now numerically behind the South-West Midlands Centre owing to the separation of Liverpool, but it ought to be able to regain the premier position. The non-technical grade of Companion was not well supported by those who could be helpful to the Institution. He commended the co-operation with other engineering societies which was practised in Manchester.

SCIENCE AND INDUSTRY

Mr. L. Romero, city electrical engineer of Salford, proposed the health of the guests. Mr. A. E. L. Chorlton, C.B.E., M.P., who replied as a member of the Institution of thirty years' standing, said that the men of the electrical industry had a technical training unequalled in any other industry.

In the matter of research the electrical industry afforded an example which the cotton industry would do well to follow. As a member of the Executive Committee of the N.P.L. he was in a position to observe the relationship between science and industry.

Those who had guided the electrical industry to its present successful position might be called in as members of a technical council to lead the country out of its difficulties instead of leaving everything to politicians.

In proposing the chairman's health, Mr. A. L. Lunn said that he was glad that the Centre, in spite of the ten years of depression, had decided to hold the dinner as usual. Manchester realised the value of such functions.

A Railwayman's Views on Electrification

IN the course of an address on "Economic Aspects of the British Railway Transport," which he delivered to members of the ROYAL PHILOSOPHICAL SOCIETY OF GLASGOW on January 13th, Mr. William Whitelaw, chairman of the L.N.E.R. Company, made reference to main-line electrification. They must be careful, he said, to understand exactly what was meant by the "economic aspect." Railway electrification might be an economic matter for the State, but the reverse for the railway companies.

The expenditure on establishing the national electricity grid was going to be very much in excess of the original estimate, and the consumption of electricity in the country so far fell far short of the original expectation. The prospect of cheap electricity from the grid seemed to be receding; not only industrial firms, but even individuals, were often able to provide themselves with electricity at a substantially lower cost. Consequently in considering the economic aspect of the electrification of the railways it must be remembered that a failure of the grid to live up to the estimates on which it was based might adversely affect the cost of electricity upon which the railway conversion estimates had been founded.

The question of electrifying suburban lines did not arise except in so far as lessons might be drawn from its known results. The great difference between suburban and main-line electrification lay in the two facts that the former depended for economic success upon an increase of traffic, and the latter upon a decrease in operation costs. Wrong conclusions might be drawn from main-line electrification in other countries; indeed, the main reason for the adoption of electrification in Switzerland, Sweden, France, Germany, and Italy was the development of their national resources of water power. This country had practically no water power, and coal was still comparatively cheap.

The whole matter, apart from raising the necessary capital, estimated at £261,000,000, seemed to depend upon the respective costs of steam and electrical operation. Assuming that the capital could be raised at a cost of 5 per cent. per annum, the report of the Main-Line Electrification Committee stated that there would be an additional remuneration of 1.7 per cent. per annum, if the traffic of 1929 was maintained. Could it

be suggested that such a return justified the application of the word "economic" to a scheme of such magnitude, even if no other consideration had to be taken into account? Mr. Whitelaw thought that "speculative" would be a more suitable adjective. As the traffic of 1931 would show a decrease, as compared with 1929, of about £24,000,000, the assumption was shattered and the basis of the calculation had gone for the time being.

Further, the capital cost of £261,000,000 included nothing for the electrification of private sidings, which would involve a very large sum, while if they were left out there would be a considerable inroad upon working expenses for the provision of steam engines with which to work them, and for which there would not be any other employment as there was at the present time.

What would the effect of electrification be upon the mining industry? It was estimated that full electrification would reduce the amount of coal required for railway purposes by 9,750,000 tons, or 3 per cent. of the output per annum.

The speaker maintained that the only verdict at which a jury could arrive upon the case as he had submitted it was that in existing circumstances of trade in Great Britain the electrification of the main lines was not economic and was quite out of the question.

"Jumps" in Neon Tubes

The periodic movements of the negative glow in gas-discharge tubes are discussed in the paper which Miss W. A. Leyshon submitted at a meeting of the PHYSICAL SOCIETY on January 15th. She gives an account of experiments she designed to reveal the cause of the jumping glow of such tubes, and shows that the effect is produced when traces of hydrocarbon vapour are present in the tube in addition to the filling gas (neon, in most of the experiments described). Some effects of such traces of vapour on the characteristics of the tube are also explained. Miss Leyshon suggests that the phenomenon may be due to internal flashing at that part of the surface of the cathode which is not covered by negative glow. The flash may be caused by the electrical breakdown of a partially insulating hydrocarbon layer, as a result of the collection of positive ions, or by a surface chemical action which occurs when the reaction-products of the discharge have reached a certain concentration at that surface. It is supposed that the electron emissivity of the surface is increased by the flash, and that the main glow jumps to the activated surface. The process is reversible and hence may be periodic. Observations connecting the periodic time of jumps with the current through the tube support this explanation, as do also other experimental results described in the paper.

D.C. Still Required

In the course of the paper on a.c. rectification, with special reference to mercury-arc rectifiers, which Mr. Cecil C. Higgens read recently before the Yorkshire branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS at Wakefield, it is pointed out that, notwithstanding the standardisation of a.c., there is still a demand for d.c., and it is likely to be a growing one. The author gives an account of the physics involved in rectification and "current flow" in metal conductors, so leading up to the thermionic valve and mercury-vapour rectifier. For the smaller glass-bulb Hewittic type of from 45 to 130 A output three anodes are used, and for those of from 130 to 265 A six anodes. Messrs. Brown-Boveri have manufactured about one and a quarter million kW of steel-bulb rectifiers of several types. In output they range from 500 to 16,000 A (18-anode unit), but there does not appear to be any reason why larger sizes should not be made. It would be difficult to justify the use of a rectifier at less than 400 V d.c., except in special circumstances. The great majority operate at from 500 to 1,500 V, but 30,000-V d.c. has been obtained commercially without any indication that the limit has been reached.

A Century of Electricity

At an evening meeting of the WOMEN'S INSTITUTE at Alton, Staffordshire, on January 13th, a talk was given by C. H. Yeaman, on behalf of the North-West Midlands J.E.A., on "Electricity," which he defined as the silent and efficient servant of the modern home, the cheap and safe power for industrial use, and the hygienic and effective light of the 20th century. The classical experiments of Michael Faraday in the Royal Institution Laboratory were described and illustrated. The speaker said that the first third of the last 100 years was one of scientific development of the principles discovered in 1821-31. The second third saw the gradual creation of the dynamo and alternator, while the third and last period had witnessed the rapid growth of the huge electrical industry, with its far-reaching consequences in commerce, business, and the home.

Resistance, Inductance, and Magnetism

Five papers submitted at the PHYSICAL SOCIETY meeting on January 15th, included one "on the measurement of electrical resistance in terms of a mutual inductance and a period," by Dr. H. R. Nettleton and Mr. F. H. Llewellyn. A cathode-ray oscillographic method of measuring inductance was explained by Prof. G. I. Finch and Mr. R. W. Sutton, and an electroscope capacity balance was described in a paper from Dr. E. S. Brown, of Melbourne University. Messrs. W. Band and Shik-chen T'ao described some thermomagnetic effects in nickel and iron, namely, the production and measurement of an e.m.f. in wire made of those metals by the simultaneous application of a longitudinal magnetising field and a temperature gradient.

Electric Transmission for Vehicles

IN Italy, the position of the electric vehicle in relation to other types is very much the same as in Great Britain. Mr. Gino Turrinelli, of Milan, who produced his first electric vehicle as long ago as 1898, came to the conclusion that one reason for its lack of success was faulty and complicated design, particularly as regarded the transmission of the power from the electric motors to the driving wheels.

He has lately produced a new model known as the "930," the chief features of which are that two electric motors and the transmission are built as a unit rear axle which can readily be applied to any vehicle, all propeller shafts and co-related gearing being entirely done away with, and that the power unit axle is connected with the chassis only through the medium of the springs. The latter are of the underslung type, and for a 5-ton lorry have a length of nearly 6 ft.

The springs are rigidly secured to the frame members only by special connections at their forward ends, through which the propulsive effort is transmitted to the vehicle: the rear ends of the springs are not rigidly connected up, but are supported in a chassis attachment in which they are free to slide. By this means, it is claimed that road shocks are not transmitted to the chassis, passengers or goods, or the accumulators. The arrangement adopted is also stated to result in a material reduction in the weight of the motors and transmission usually employed.

The motors, the outer bodies of which are of forged steel and practically form the axle casing, have the outer ends of their shafts extended to support the spring pads, the twin brake shoe carriers, the brake drums, the road wheels, and the driving mechanism. The end cover, G, of the electric motor (see illustration on page 125), which is secured by bolts, forms a unit with the spring pad, the brakeshoe carrier, S, and a sleeve for the driving pinions. The brake drum, R, and the drum, *Si*, to which the internally toothed driving ring, *d*, is bolted form another unit, fitting within and secured to the road wheel.

The outer extremity of the motor shaft is specially made with a morse coned end, F, into which fits the shaft, *p*, of the driving pinion, T, which passes through a triple-armed sleeve, *Fi*, carrying three gear wheels with which the pinion, T, meshes, the three gears being in turn in mesh with the internally toothed gear ring, *d*, through which the power is transmitted to the road wheels. All the rotating parts are entirely enclosed and in this way are protected from the rapid wearing action of dust and dirt; moreover, they are all mounted on ball or roller bearings, this applying to the pinion end of the short driving shaft, *p*, which is carried in a recess in the wheel cover plate.

It is claimed that the whole driving axle can, when necessary, be removed from a vehicle in under two hours, the only work necessary being the removal of the bolts securing the spring stirrups and the release of the motor cables and the brake-operating levers and rods. Consequently, the designer asserts, the costs of maintenance are reduced both as regards labour and time, a vehicle so equipped being available for actual use to the extent of 99 per cent. of the total working hours.

A further advantage claimed is that the ratio of the driving gear can be easily adapted to suit the requirements of any particular district by varying the sizes of the pinion, the three gear wheels and the internally toothed gearing.

The brakes fitted to the vehicle are of a special hydraulic servo-operated type, which to a degree are self-adjusting to compensate for any wear that may take place in the brake shoe liners. The controller enables two motors to be run in series or in parallel according to requirements.

We understand that comparative tests have been made with a 5-ton electric truck embodying the Turrinelli axle and one of ordinary type. The former showed a consumption for a gross load of 10 tons of 80 watt-hours per ton-mile as against 104 watt-hours for the other, both running at an average speed of 20 m.p.h. The power consumption of the Turrinelli vehicles with solid tyres is said to be no greater than that of one of normal construction shod with pneumatic tyres.

Vehicles embodying this rear axle can be obtained for 30-cwt., 3-ton, and 6-ton loads for normal speeds of about 20 m.p.h. on the level with a maximum of 28 m.p.h. Six-wheel vehicles for heavy loads can be supplied with two motor-driven rear axles. The accumulators are carried under the centre of the chassis in such a way that they can be recharged *in situ* during the night, or replaced by a fully charged set.

The system is said to be equally well suited for use on vehicles which carry their own power-producing plants or for trolley buses.

Correspondence

Correspondents should forward their communications as early as possible. No letters can be published unless we have the writer's name and address in our possession

Electric Clocks

It has been interesting to us to read the correspondence and the various theories which have been put forward during the last few weeks in your journal with regard to synchronous motor-driven clocks.

We are not particularly interested in the household clock, but so far as time switches are concerned, the fact is nobody knows very much how they are going to pan out in this country. It may be old-fashioned prejudice but we are just a little hesitant about them; nevertheless, we have put ourselves in the position of being able to supply these, or ordinary electrically wound clocks as well as hand wound ones, so from a purely business point of view, it does not matter to us which a customer may prefer.

The contracts we have in hand are sufficiently large and diversified for us to get to know something more about the synchronous motor type during the next twelve months. It is not so much the question of a big breakdown causing a stoppage of the clocks that we are afraid of. It is more the hundred-and-one little happenings locally which put individual switches out of operation that make us doubt whether they are safe devices to use where anything serious is involved in their failure.

There are practical reasons why they are unlikely to run for long periods without attention any more than ordinary clock-driven switches.

VENNER TIME SWITCHES, LTD.,
Ernest E. Sharp, *Director*.

New Malden, *January 15th*, 1932.

Referring to the letters of Mr. S. F. Philpott and Messrs. Everett, Edgcumbe published in the ELECTRICAL REVIEW of January 8th and 15th regarding electric clocks, several people of my acquaintance in the town in which I live have recently bought synchronous clocks. Although the town is classed as one of the leading industrial cities of England, the frequency is not controlled; therefore these clocks are useless.

Each Sunday morning at a varying time the power supply is cut off for, in some cases, a full hour. Very often this cessation of supply is at a critical period of the morning, when those who are using electric cookers are in the middle of cooking dinner.

This stoppage of supply is not at all conducive to the sale of electrical equipment for the home. In many cases householders would have installed electric cookers and clocks in their homes were it not for the unreliability of their power supply.

Surely the Central Board has some jurisdiction in cases like this, where the sale of domestic and time-keeping equipment is retarded by an inefficient power supply.

January 17th, 1932. S. M.

Still the Boiling Plate

A number of the points raised by your correspondents in connection with this matter are extremely interesting, and prove that the question of the cooker boiling plate is a very vexed one indeed.

It is a regrettable truth that, whatever its origin, the electric boiling plate with its varying degree of efficiency (according to type) is far too slow to satisfy the requirements of the average consumer, but it is distinctly unfair to condemn the electric cooker because of the boiling plates. The oven and grill are particularly good and superior from every point of view to any other kind of oven or grill available to the public.

The popular modern type of enclosed boiling plate is the best thing of its kind yet evolved, and in conjunction with machined-bottom utensils gives a reasonably quick boil. For example, an 8-in diameter enclosed boiling plate with a loading of 1,600 W, through the medium of an 8-in. diameter, ¼-in. thick, machined-bottom kettle, will supply 3 pints of boiling water from cold in 10 minutes.

Of course, the question of efficiency is a very important one indeed, and no one will argue that the modern type of enclosed boiling plate is efficient—far from it. The efficiency or inefficiency of boiling plates, however, might quite well be left to the research laboratories of the various cooker and boiling plate manufacturers, but the all important question of speed in boiling—*even at the expense of efficiency*—is one of the utmost urgency if we are to compete successfully with the gas industry and obtain—and retain—electric cooker consumers.

I strongly object to a compromise between gas and electricity on principle. It is an admission of inadequacy—of failure—and it won't do. At the same time I must agree that the modern electric boiling plate, in comparison with gas, is slow. If one analyses the various complaints levelled against the boiling plate, however, it will be found that in almost all cases the trouble is purely and simply in connection with the boiling of water (usually the "first" boil and particularly the boiling of water for breakfast).

Probably the speediest and most efficient method of small-quantity water boiling (2 to 5 pints) is by means of the self-contained, immersion heater type electric kettle. Even so, a loading of 1,000 W, which is somewhere near the maximum loading permissible in, say, a 3-pint kettle of orthodox design, will only produce 3 pints of boiling water in 9 minutes, and to recommend that consumers be supplied on hire with, or be asked to purchase, a self-contained kettle for use *instead* of the cooker boiling plates is again an admission of failure and therefore undesirable.

The boiling of 3 pints of water on an enclosed type of boiling plate having a loading of 1,600 W—provided that a machined-bottom utensil is used—can be carried out at approximately the same speed, from cold, as with the 1,000-W self-contained immersion heater type kettle. But neither of these boiling times compares favourably with the gas ring.

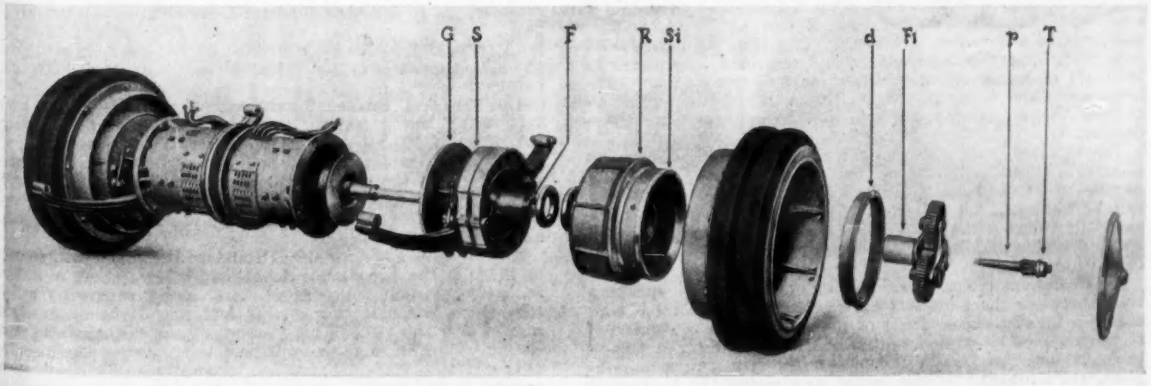
Ideas and suggestions for the speeding-up of such boiling times therefore appear to be called for, and I submit herewith an idea which I have carried out, and which, I suggest, if properly exploited, might quite easily overcome the present prejudice and difficulties as a temporary measure, pending the introduction of that much discussed and long looked for "perfect boiling plate." The idea is particularly simple, it may not even be original; it is, however, effective.

I obtained a 5½-pint, 8-in. diameter, ¼-in. thick, machined-bottom aluminium kettle of well-known make (the shape of the 3-pint size available did not lend itself easily to my experiment) and into this kettle I introduced an immersion heater loaded to 1,000 W. The contents of this kettle could be heated:—(a) Exclusively from the boiling plate; (b) exclusively from the immersion heater; or (c) by a combination of both simultaneously.

Such a kettle complete should not cost the supply authority more than, say 20s. net, even in small quantities. The immersion heater, also of well-known make, which is of the quickly replaceable type, is complete with an automatic safety device; and as the kettle itself is in one piece (apart from the spout, which is welded) I do not consider that any undue apprehension need be felt in connection with the life either of the kettle or the immersion heater.

It is the practice of most supply authorities when installing a cooker to provide a double-pole main switch at the cooker end of the installation, carrying a pilot light and a 5/10-A. plug. In some cases the plug and—more rarely—even the main switch are mounted on the switch panel of the cooker itself. However, whatever arrangement exists I do not consider that much difficulty would be experienced by any enterprising authority, having a cooker hire scheme, in providing its consumers with the necessary "feed" to the immersion heater.

I have searched very carefully for the inevitable "snags" and can find only three. The first is that if a consumer decides to heat up the kettle and contents using the immersion heater only, and places the kettle on a piece of furniture, the results will be disastrous to the polish and woodwork. The second is that where a consumer, again utilising the immersion heater only, leaves the kettle on a mass of cold



A dis-assembled view of the Turrinelli axle system which is dealt with on the opposite page

metal such as a cold boiling plate or the cooker hob, or on a marble or stone slab, loss of heat by conduction will result, which means, of course, a lowering of efficiency and a consequent longer boiling time. The third "snag" is purely a technical one and arises only in those supply areas where the practice of balancing a cooker "against itself" prevails, and it will be patent that in such cases care must be exercised to ensure that the particular phase or polarity of the live side of the immersion heater "feed" is common with that of the boiling plates as otherwise, even although the kettle is automatically earthed to the cooker when resting on the boiling plate, serious trouble might well result under certain obvious conditions.

It is interesting to note that the specimen kettle under review is by no means the last word. In the first place the immersion heater of 1,000-W loading was taken from a 3-pint kettle having an internal diameter of 6¼-in., whereas the 5½-pint machined-bottom kettle into which it was introduced has an internal diameter of 7⅜ in., which means that either an immersion heater having a higher loading but running at the same temperature, or an immersion heater having the same loading but running at a lower temperature could be utilised.

However, by employing both immersion heater and boiling plate simultaneously, 3 pints of water were brought to boiling point from cold in a fraction over 6 minutes, which is something we have not yet been able to offer to the public.

G. C. HADFIELD,
Showrooms Manager, Corporation Electricity Department.
Nottingham, *January 12th*, 1932.

In your issue of January 15th Aidas Electric, Ltd., make certain claims for their boiling plate, and whilst it is very nice to learn of progress made they omit to state the reasons. Questions that at once arise in one's mind are:—What is the feature mentioned which makes the plate more reliable than any other on the market, and what causes it to be quicker with cheaper utensils? The word efficiency again crops up, but this time in a more sweeping sense, the claim being made that their plate is more efficient than any other type now on the market.

Supposing we now get down to the meaning of efficiency and for the convenience of future claimants ask them to state how long it takes the plate to boil a quantity of water at full heat, and the electrical energy used. This would go towards clarifying the situation, but what we really require is a performance curve involving efficiency and time.

If in practice we find the expenditure of energy at full heat to be four times the theoretical figure we can safely assume the efficiency to be in the region of 25 per cent. This figure varies with time, however, as there is a different loss at differing speeds, and we might therefore plot on a performance curve thermal efficiency against time to raise a certain quantity of water from and to given temperatures.

Each type of plate has its own particular characteristic, but once such a curve is obtained it is easy to see the effect of various improvements, and, in addition, to glean other useful information such as how the efficiency and performance vary in use. This method need not be confined to boiling plates, and the results can always be checked by the N.P.L.

Huddersfield, *January 15th*, 1932. CHARLES E. BAXTER.

Jerry Wiring

The ELECTRICAL REVIEW is evidently backing the efforts of the National Register to bring "jerry" wiremen to the ground, but I wonder if the Register has started at the right end; are not the supply companies to blame? They are the people who connect the shoddy job.

I know a house in this district that has not got a main switch, yet it is on the main. I saw a house last week that was "wired" throughout in "flex" all done by "my clever son-in-law," not by the contractor. Anybody has a right to do anything in his own house so long as the company that supplies the energy does not look round to see these "special occasion" wiring jobs.

Another point is this—if we are to have a National Register of contractors, we need a graded and properly paid register of men and a standardised system of manufacture, but by the time all that is done you will find you have developed a "standardised" customer who won't pay the price of the job.

My advice is that a standard test of inspection should be demanded and that the contractor should be left alone. Keep out the handyman, the "clever son-in-law" and the others by all means, and that can be done by periodical inspection and the cutting off at twelve hours' notice of all jobs that are not up to the standard.

E.D.A. could do a good turn by publishing a standard booklet that could be sent out with application forms, telling people that the dangers of interfering with wiring are great and should not be allowed. Education is costly, and so is unemployment, and many good men are out of a job to-day on account of the supply companies' neglect to keep the wiring up to scratch.

E. TIPPINS (*Tippin Electrical Service*).
London, W.11, *January 12th*, 1932.

Radio-telephony for Light Aircraft

THE Automobile Association (Aviation Division) is now rendering service to owners of private aircraft through its radio telephone broadcasting station at Heston airport, which is the first of its kind in this country, and probably in the world. By means of the regular transmissions from this station a pilot can tell what weather conditions he is likely to encounter as he continues on his course, provided he has a suitable receiver installed in his aeroplane. Standard Telephones & Cables, Ltd., who supplied the transmitting equipment for the Heston station, have now developed a suitable receiver for such aircraft.

In the case of light aircraft it is vital to limit the weight of any instrument to the absolute minimum, in order that the limited supply of petrol carried need not be further curtailed. The weight of the complete four-valve receiving equipment, including batteries and aerial, has been brought down to 19 lb. 8 oz. The actual receiver measures only 9¼ in. by 4¼ in. by 4¼ in. and weighs 4 lb. 10 oz., and can thus be stowed away easily in either the pilot's or the passenger's cockpit.

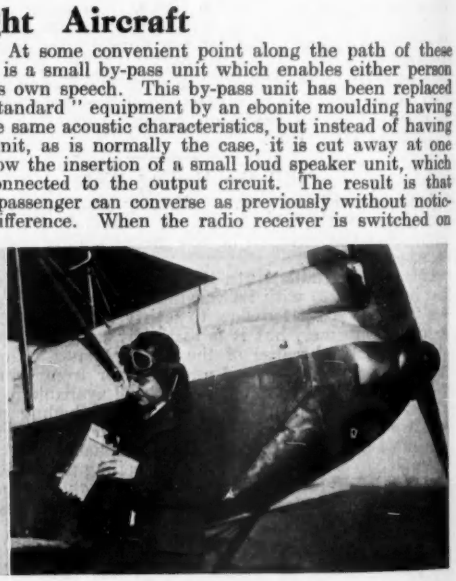
It is housed in a light-weight strong metal box, and in this remarkably small space are housed two screened-grid h.f. amplifying stages, followed by a sensitive detector stage, and a transformer-coupled l.f. amplifier stage, with a special output circuit.

The wavelength range is from 600 to 1,000 metres, all tuning being done with a single knob and dial, so arranged that it can be manipulated even when wearing flying gloves. A light metal box containing the accumulator and the grid bias and h.t. batteries is connected to the receiver by means of a multi-cored cable and a pair of plugs. The cable, together with the rest of the equipment, is screened against magneto interference.

The receiver must be usable both in the air and on the ground, and even when the machine is moving over the ground in the process of landing or taking off. The normal type of trailing aerial is therefore of little use, and a small fixed aerial has been designed that fits between the wing tips and the tail. This aerial collapses with the wings when they are folded for garaging.

It is common practice on light aircraft to provide speaking tubes between the pilot and his passenger. These tubes consist of a mouthpiece in front of the pilot, which is connected through a tube to earpieces fitted permanently into the passenger's helmet. In front of the passenger is a similar mouthpiece which operates in exactly the same manner in the reverse direction. At some convenient point along the path of these two tubes is a small by-pass unit which enables either person to hear his own speech. This by-pass unit has been replaced in the "Standard" equipment by an ebonite moulding having exactly the same acoustic characteristics, but instead of having a sealed unit, as is normally the case, it is cut away at one side to allow the insertion of a small loud speaker unit, which is then connected to the output circuit. The result is that pilot and passenger can converse as previously without noticing any difference. When the radio receiver is switched on both pilot and passenger can hear all received signals. This obviates all necessity for fitting flying helmets with special earpieces.

The four-valve receiver



Sir Alan Cobham examines the equipment

The range of this equipment on an aircraft of the Moth type using the previously mentioned "fixed" aerials is of the order of 100 miles of telephony from a "Standard" air port of the Heston class. Although the receiver is much more sensitive than the usual broadcast receiver, there is no undesirable "background" of interference from the engine, and the speech received, even at a range of 120 miles, is remarkably clear.

An interesting use for the "Standard" receiver will shortly be made at the Brooklands School of Flying. There it will be used for instructional purposes, and will give greatly added confidence to the learner on his first solo flight by enabling him to hear the voice of his instructor, just as though he were sitting with him in the aeroplane.

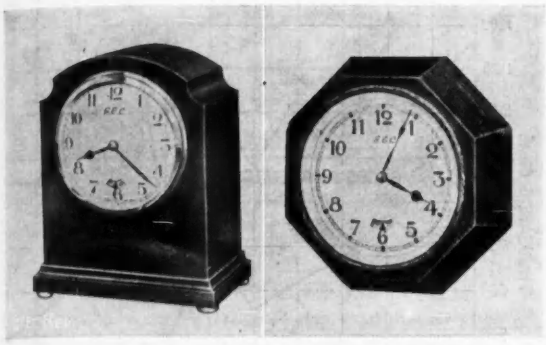
The Heston station broadcasts promptly authentic weather reports of the whole of the area covered by the British Isles.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Synchronous Electric Clocks

A recent development of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is an extensive range of synchronous electric clocks in a wide variety of finishes and designs suitable for use in the home, office, shop, &c. The movement in the smaller patterns is mounted in an all-insulated drum and is interchangeable with the 3¼-in. standard drum



G.E.C. electric clocks in "Bakelite" cases

movement fitted in a large proportion of existing spring-driven clocks; old movements can therefore be superseded, and the original case modernised by the substitution of the new. The movement is geared direct to a tiny synchronous electric motor which runs at only 200 r.p.m.

The dials and bezels, respectively, are finished in silver, cream and black, chromium, oxidised silver, and lacquered brass, and are selected to suit the case in which the movement is mounted. A very extensive variety of cases in walnut, oak, mahogany or coloured lacquer are available, and special mention may be made of the artistic effects obtained by the use of moulded "Bakelite" cases which are supplied in brown, black, "jazz," and marble finishes in addition to the better-known walnut and mahogany varieties. The clocks operate at 200/250 V, 50 cycles, unless otherwise specified, and movements only can be supplied if so required, complete with fixing ring, dial in cream, silver, or black, Arabic or Roman figures, and oxidised-silver, lacquered-brass, chromium-plated, or black bezels. They are made entirely in England under British patents.

Varnish for Enamelled Wire

Messrs. JENSON & NICHOLSON, LTD., Goswell Works, Stratford, E.15, have recently introduced an addition to their range of "Lacwatt" black insulating varnishes. It is intended for use where difficulties have been experienced in the use of varnish on enamelled wire, as it is claimed to have no action whatever on the enamel. Further, the new varnish does not "throw," and it has a very high dielectric strength. We understand that the company is prepared to send a small working sample of this new insulating varnish for examination and test by those who are interested in the matter.

Shop-window Reflectors

A recent addition to the range of "X-Ray" shop-window reflectors produced by the EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4, is a number of "Silver Dome" units. The domes, which are of mirrored glass and are moulded with the reflector proper in one unit, result in increased efficiency, with greater lighting intensity on the display and less wasted illumination on the pavement.

A "Silver Dome X-Ray" reflector

The reflectors can be fixed above the top of the window glass, or a pelmet may be used to hide them, at the same time affording provision for advertising in day time. The construction is unique, in that each reflector is moulded with three dimples inside by means of which colour screens and anti-glare shields can be quickly secured. The shields prevent side glare where the reflectors are visible from side windows. There are now five sizes of "X-Ray" reflectors suitable for from 100- to 500-W gasfilled lamps. Each size is made in two patterns to suit different shapes of windows—one with the rim at an angle from the horizontal, for deep windows and windows of medium depth with high dressings at the back, and the other with the rim horizontal for shallow windows.

Outboard Motor for Small Boats

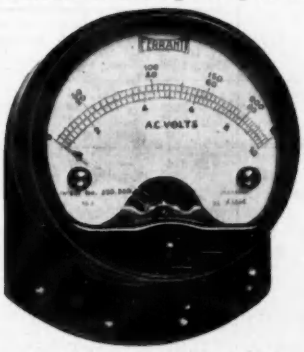
An electric outboard motor which will propel a dinghy or canoe at 5 m.p.h. and is quite silent in operation has lately been put on the market in this country by Mr. J. W. SHILLAN, 24, Harrison Street, W.C.1. The motor is contained within a streamlined underwater casing and is coupled direct to the propeller. This casing is attached to a swivelling vertical shaft secured to the boat by brackets, having a drum at its upper end round which the steering cable passes, as shown in the illustration. This arrangement enables the driving unit to be turned completely round, thus altering the direction of thrust of the propeller and so giving an instantaneous reversing action to the vessel, an important emergency feature.

A propelling unit for small craft

Current is supplied by a 6-V battery which affords four hours' continuous running. Two models of the unit are made, one with attachments suitable for a canoe, and the other designed for use on square-sterned boats. A length of flexible conductor is supplied with the outfit, so that connection can be made with a nearby source of electricity, rendering it unnecessary to remove the batteries for recharging purposes.

Three-range M.I. Voltmeter

Messrs. FERRANTI, LTD., Hollinwood, Lancs., have recently extended their range of 2½-in. dial instruments by the introduction of a three-range moving-iron voltmeter scaled 0-10-100-250 V, and it is believed that this is the first instrument of its size suitable for measuring a.c. filament voltages and a.c. mains voltages by the same, self-contained instrument. It is available in the switchboard, flush and projecting patterns, as well as in the portable model illustrated, and is suitable for from 25 to 100 cycles per second. As in the case of the other types of instruments in the range, B.S.S. first-grade accuracy is afforded, while a long scale, a high torque and excellent damping are amongst the other features of the instrument, for which there should be considerable demand, particularly among radio engineers.



New Ferranti miniature voltmeter

A Hot-wire Relay

Messrs. GRIFFIN & TATLOCK, LTD., Kemble Street, Kingsway, W.C.2, are the makers of the hot-wire relay illustrated herewith. It is a simple device in which the actuating member is a wire heated electrically. It is equally applicable to

A hot-wire relay

direct and alterating currents, and has been used chiefly for the thermostatic control of electrically heated laboratory apparatus. It was one of the company's exhibits at the Physical Society's recent exhibition.

British Overseas Electrical Trade in 1931

Reduced shipments and purchases

THE effect of the introduction of import duties is very apparent in the December trade figures published by the Board of Trade. A study of Table I reveals that although there was a decrease of approximately 10 per cent. in electrical exports during December, as compared with the preceding month, imports showed a decline of 57 per cent.

Unenumerated electrical goods and apparatus, and unenumerated machinery, with decreases of £31,346 and £27,309 respectively were mainly responsible for the fall in exports,

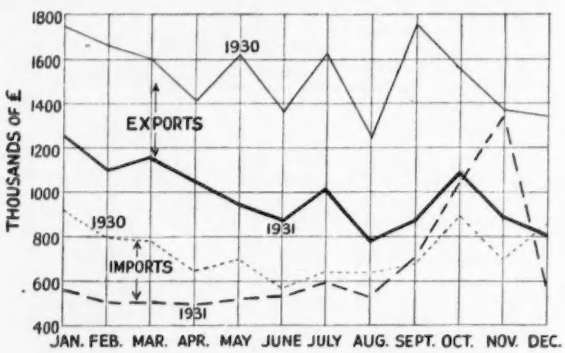


Fig. 1.—Monthly electrical exports and imports

as compared with the November figures, but there were also substantial falls in shipments of insulated cables and wires, batteries and accumulators and "other motors and generators." Telegraph and telephone apparatus exports were the only items to exhibit any notable increase.

Imports show large decreases in every section, compared with November, telegraph and telephone apparatus (£383,564 decrease), and unenumerated electrical goods and apparatus (£117,505 decrease), being the items most seriously affected. Although comparatively small items, it is of interest to note that imports of glow lamps and batteries and accumulators both fell by nearly 70 per cent.

Compared with December, 1930, exports were 31 per cent. and imports 35 per cent. lower. The chief contribution to the fall in exports was made by unenumerated electrical machinery and insulated cables and wires, while telegraph apparatus and telephone apparatus, unenumerated electrical machinery, and batteries and accumulators were mainly responsible for the decline in imports.

Re-exports at £20,881 were £4,826 lower than in November, and £32,618 below the December, 1930, figure.

Referring to the totals for the complete year given in Table III, it will be seen that, while exports fell from £18,273,555 to £11,796,633, imports at £7,888,480 were only £956,429 lower. Carbons, with a comparatively insignificant

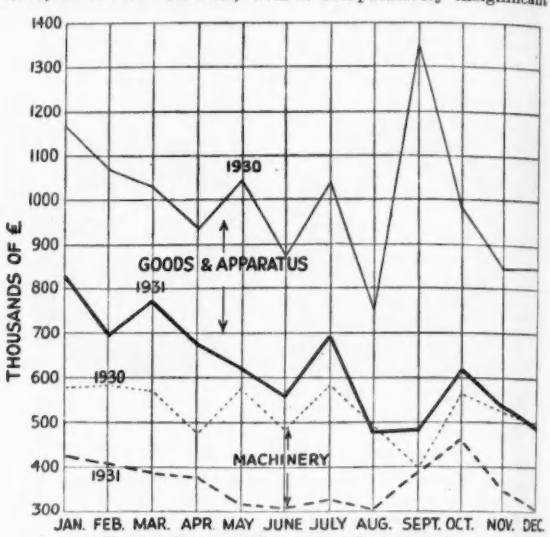


Fig. 2.—An analysis of electrical exports

increase (£9,587), were the only item showing any advance in the export list, and the majority of sections—in particular electrical machinery and insulated wires and cables—displayed very large decreases.

Table I.—Exports and Imports during December, 1931

	EXPORTS.			IMPORTS.			RE-EXPORTS.		
	Electrical Exports for Dec., 1931.	Inc. or dec. as compared with Nov., 1931.	Inc. or dec. as compared with Dec., 1930.	Electrical Imports for Dec., 1931.	Inc. or dec. as compared with Nov., 1931.	Inc. or dec. as compared with Dec., 1930.	Electrical Re-exports for Dec., 1931.	Inc. or dec. as compared with Nov., 1931.	Inc. or dec. as compared with Dec., 1930.
Electrical goods and apparatus (unenumerated)	£131,714	−£31,346	− £77,279	£136,815	−£117,505	− £32,237	£4,951	−£1,189	− £8,507
Insulated cables and wires	86,793	− 16,639	− 108,279	58,329	− 27,546	− 25,752	335	− 109	− 224
Glow lamps	24,907	+ 3,547	− 11,868	34,393	− 73,061	− 16,798	855	− 25	+ 315
Arc lamps and parts	1,850	+ 1,616	− 433	2,914	− 1,178	− 1,669	6	− 11	+ 6
Batteries and accumulators	47,415	− 17,774	− 25,061	27,018	− 54,260	− 52,893	479	+ 96	− 260
Meters and instruments	23,674	− 2,707	− 2,098	29,531	− 18,769	− 10,624	729	+ 332	− 2,549
Carbons	5,302	+ 3,046	+ 3,458	26,715	− 15,684	+ 7,781	325	+ 54	+ 289
Switchboards (not telegraph or telephone)	2,177	+ 129	− 7,031	176	− 53	+ 44	23	− 2	+ 23
Electrical Machinery—									
Electrical machinery (unenumerated)	169,254	− 27,309	− 122,419	139,739	− 54,013	− 53,003	7,314	− 3,367	− 4,927
Railway and tramway motors	3,540	+ 1,158	− 9,420	—	—	—	—	—	—
Other motors and generators	134,019	− 17,681	− 58,097	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	12,477	− 6,923	− 40,634	1,388	− 2,957	− 7,900	68	− 1,164	− 33
Submarine telegraph and telephone cables	13,403	+ 6,468	− 16,365	—	− 24,100	—	—	—	—
Telegraph and telephone apparatus	137,200	+ 13,384	− 70,963	105,795	− 383,564	− 105,747	5,796	+ 559	− 16,751
Total	£793,725	−£91,031	−£546,489	£562,813	−£772,690	−£298,798	£20,881	−£4,826	−£32,618

The fall in imports during 1931 was due almost entirely to a decline from £1,472,222 to £388,363 in imports of meters and instruments, although there was also a substantial falling-off in insulated wires and cables, batteries and accumulators and electrical machinery. Telegraph and telephone apparatus imports, however, were £529,670 higher, and some advance was made in the unenumerated goods and apparatus section.

A comparison of the exports of electrical machinery during the past two years is given in Table II, and, as already mentioned, there were large declines in the totals of both volumes and values. The unit value increased from £154 per ton in 1930 to £159 per ton in 1931—or 3.2 per cent. With the exception of a slight increase in the quantity of electrical

Table II.—Exports of Electrical Machinery

Destination.	QUANTITIES.			VALUES.		
	1930.	1931.	Inc. or dec.	1930.	1931.	Inc. or dec.
	Tons.	Tons.	Tons.	£	£	£
European Countries	8,010	7,191	− 819	1,445,880	1,272,578	− 173,302
Japan	615	113	− 502	103,091	25,106	− 77,985
South America	4,543	2,196	− 2,347	733,649	369,261	− 364,388
South Africa	3,642	2,395	− 1,247	501,023	378,920	− 122,103
British India	6,698	4,330	− 2,368	1,066,472	713,497	− 352,975
Australia	5,216	912	− 4,304	731,810	133,042	− 598,768
New Zealand	2,763	1,252	− 1,511	379,427	208,994	− 170,433
Canada	3,062	2,086	− 976	371,698	270,914	− 100,784
Other Countries	6,663	6,780	+ 117	1,012,571	986,377	− 26,194
Total	41,212	27,255	− 13,957	£6,345,621	£4,358,689	− £1,986,932

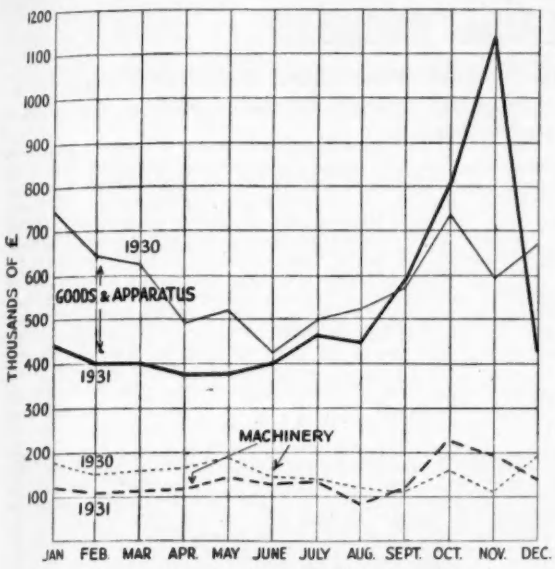


Fig. 3.—An analysis of electrical imports

machinery exported to "other countries," both volumes and values show decreases in every case. Australia, South America and British India accounted for the major portion of the decline. Our chief customers, European countries, did not reduce their purchases to such a noticeable extent, but were nevertheless responsible for £173,302 of the decrease. The development of home production appears to be reducing opportunities in Japan, and it is disappointing to find that both Canada and New Zealand—hitherto a bright feature of the market—are purchasing considerably less from this country.

We illustrate this article with a series of curves showing the monthly levels of exports and imports. It will be seen from fig. 1 that in not a single month of 1931 did exports come to within £400,000 of the value for the corresponding month of 1930. Imports, on the other hand, although below the 1930 figures for the first part of the year, made an enormous jump between September and November on fears of tariff impositions, falling back to well below normal last month.

An analysis of electrical exports, showing goods and apparatus, and machinery separately, is contained in fig. 2. Goods and apparatus being the larger constituent, and also subject to wider fluctuations, determine the shape of the total curve. It will be noticed that, in general, the machinery curve follows the other very closely.

Fig. 3 similarly analyses the electrical imports. The predominance of goods and apparatus in the import total also makes the curve illustrating the monthly totals a reflection of the fluctuations in this section.

Table III.—Exports and Imports during 1930 and 1931

	EXPORTS.			IMPORTS.			RE-EXPORTS.		
	1930.	1931.	Inc. or dec.	1930.	1931.	Inc. or dec.	1930.	1931.	Inc. or dec.
Electrical goods and apparatus (unenumerated)	£2,703,603	£1,886,436	— £817,167	£1,630,475	£1,732,480	+ £102,005	£112,735	£75,699	— £37,036
Insulated wires and cables	2,915,586	1,416,035	— 1,499,551	932,685	769,439	— 163,246	6,987	12,923	+ 5,936
Glow lamps	589,356	346,239	— 243,117	562,699	471,406	— 91,293	10,654	5,944	— 4,710
Arc lamps and parts	20,918	9,967	— 10,951	31,946	50,778	+ 18,832	983	795	— 188
Batteries and accumulators	890,785	704,282	— 186,503	774,056	629,343	— 144,713	30,435	15,478	— 14,957
Meters and instruments	361,479	311,909	— 49,570	1,472,222	388,363	—1,083,859	62,647	7,956	— 54,691
Carbons	12,928	22,515	+ 9,587	194,446	231,104	+ 36,658	4,352	3,181	— 1,171
Switchboards (not telegraph or telephone)	88,787	37,174	— 51,613	1,210	1,349	+ 139	34	351	+ 317
Electrical Machinery—									
Electrical machinery (unenumerated)	3,888,581	2,514,190	— 1,374,391	1,818,233	1,636,306	— 181,927	139,537	122,465	— 17,072
Railway and tramway motors	182,473	81,157	— 101,316	—	—	—	—	—	—
Other motors and generators	2,274,567	1,763,342	— 511,225	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	827,616	469,435	— 358,181	32,230	29,435	— 2,795	403	2,745	+ 2,342
Submarine telegraph and telephone cables	802,923	169,314	— 633,609	—	24,100	+ 24,100	—	250	+ 250
Telegraph and telephone apparatus	2,713,953	2,064,638	— 649,315	1,394,707	1,924,377	+ 529,670	255,415	90,659	— 164,756
Total	£18,273,555	£11,796,633	—£6,476,922	£8,844,909	£7,888,480	— £956,429	£624,182	£338,446	—£285,736

The Acorn Telephone Exchange

THE Acorn exchange, the new step-by-step automatic exchange at Acton equipped with 4,600 lines and having an ultimate capacity of 10,000 lines, was brought into service on January 7th. This is the first exchange in the world to be installed utilising throughout General Post Office "standard open type" (single-sided) racks. All the equipment was manufactured by Standard Telephones and Cables, Ltd.

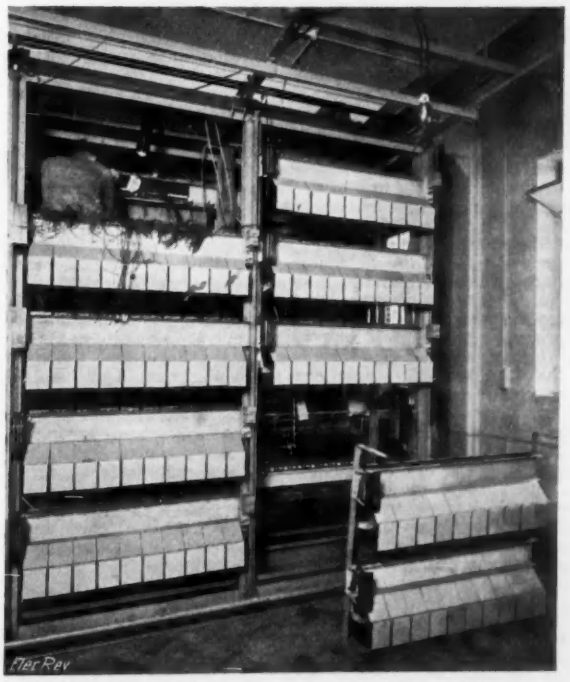
The equipment is arranged on three floors as follows: First floor, all the offices and apparatus room; second floor, power plant and apparatus room; third floor, offices and manual room. The Acorn exchange handles all manual traffic for the Southall and Perrivale automatic exchanges, neither of these two having manually operated apparatus.

The adoption of this new open-type racking scheme has made it possible to introduce numerous improvements, both in the circuits and in the design of the apparatus, that were previously not practicable when using the old method of mounting. To guard against dust an entirely new method of shipping and "piece-meal" installation and assembly has been tried out. This consisted of erecting all the heavy ironwork, fixing it to walls and ceilings, running in the cables, completing all the heavy and dirty work and removing scaffolding, before any of the delicate pieces of apparatus were introduced into the building.

When it is understood that this means building up the complete exchange equipment in the factory, testing it, breaking it down for shipment, and then reassembling it on the site, some idea of the magnitude of the task will be realised.

Once the equipment is in the building all dust is excluded by means of one-way ventilators and the air purified by means of the Plenum system; the air is drawn in by an electric fan, passed through a series of filters, and evenly distributed throughout the building. This new method of installation allows the installation and shop periods to overlap, whereas in bulk shipment methods the installer can do practically no work until the most detailed piece of apparatus has been manufactured, thereby losing many valuable weeks. Moreover, the process of handling must be studied. In this direction also the "piece-meal" method possesses considerable advantages as no expensive haulage tackle is required.

A special feature of the Acorn exchange is the introduction of routine testing bays, which eliminate the human element almost entirely. Previous to the introduction of this system it was necessary for an operator to go round with a test box and test each piece of switching apparatus individually. In the new system the operator merely has to press a button which immediately sets up a train of switches which completely test the whole exchange, registering by means of lamps any faults that may be found.



Open-type rack unit at the Acorn Exchange ready to be placed in position

Germany and the Crisis

The situation of the electrical manufacturing and supply industries

A REPORT on economic conditions in Germany, to September, 1931, has just been issued by the Department of Overseas Trade (price 4s. net). The joint authors are Mr. J. W. F. Thelwall, the Commercial Counsellor, and Mr. R. P. F. Edwards, the Commercial Secretary at H.M. Embassy, Berlin, and the report is an interesting corollary to the findings of the recently published second Basle report of the special Advisory Committee under the Young Plan. It shows how all German industries were affected by the general depression throughout the world, although here and there in the country individual firms achieved good results.

Certain of the electrical manufacturing concerns, for example the A.E.G., Siemens, Ludwig Loewe & Co., and Osram, did fairly well in 1930. The report gives some useful details of working agreements concluded and participations arranged by these and other companies.

Probably the most important question relative to Germany's economic structure is how far can she continue to maintain a favourable balance in her foreign trade. The question has to some extent been answered from Basle, and in this report there is much information which explains how the conclusions arrived at at Basle came to be reached. Germany's exports, it is pointed out, were stimulated to an extraordinary degree by the weakening of her home markets and her heavy foreign debt obligations. At the same time these factors discouraged imports, and as the prices of primary materials fell a handsome export surplus resulted.

The report recalls briefly certain past events which render the recent crisis the more understandable. It points out that by 1923 Germany had practically lost her total working capital and that all she possesses of her own is what she has been able to earn since. The commercial and industrial situation of the world during the intervening period has not been such that these earnings are likely to be large in comparison with the requirements of the country. A considerable proportion of the capital formed each year had to be transferred to Germany's creditors. These facts have to some extent been obscured by the operation in Germany of the proceeds of the foreign loans which she took up. For the first few years these loans were long-term and the uses to which they were put provided plenty of activity in the German home market: factories were re-equipped and extended and the municipalities built power plants, waterworks, underground railways, &c. While these enterprises were in full swing the time came when it was impossible to raise long-term loans; on the contrary German money was attracted to the United States by the speculative boom and the high rates of intrest.

Forced Exports

Germany therefore found herself with many half-finished schemes of development and with a high productive capacity but a weak home market. Naturally she turned to exports and with very considerable success, but soon this alternative lost in effectiveness as the world depression grew in intensity. Reparations which had hitherto been paid out of borrowings now began to press heavily upon her and, in addition, the service of the foreign loans had to be met in spite of the fact that the plant and public works in which they were invested were only partly productive.

The subsequent appeal to and intervention of the banks, which could do little more than accept short-term money from abroad, is common history. The authors express the opinion that had the world crisis lasted only eighteen months or so, as was probably anticipated, the conversion of the obligations into long-term loans might have been possible. Political distrust, however, was superimposed on economic distress. President Hoover's scheme for a twelve months' moratorium on reparation payments provided a temporary respite, but soon stringent measures had to be taken to prevent a run on the banks, the complete withdrawal of foreign credits and collapse of the German exchange.

The paralysing effect on trade and industry was accentuated by a number of drastic decrees controlling commercial operations, which culminated in the emergency decree that was passed a little while after the period covered by Mr. Thelwall's report, which sought to make simultaneous reductions in prices, wages, salaries, interest rates and the standard of living.

It is significant that the Commercial Officers take the view that the strenuous exertions made to promote Germany's exports in every possible way will be carried on with increasing energy. They say, however, that there are probably no great stocks of goods in Germany but there are big accumulations of coal and of raw materials not produced within the country but brought in for purposes of manufacture and no longer needed in view of reduced industrial activity. These materials include iron ore and copper, and it is possible that in order to obtain funds and avoid losses on idle capital these stocks will be thrown on to the market at low prices and exercise an unsettling effect internationally.

Electrical and Radio Trade

It is pointed out that export trade was again largely responsible for the favourable development of the electrical engineering industry. In 1930 the value of electrical machinery sold abroad rose, while that of electrical apparatus and equipment fell slightly. Adding insulated wire and other products, the total exports in 1930 were only 8,000,000 m. less in value than in 1929.

Special success was achieved in the sale abroad of telephone, telegraph, and radio apparatus. It was estimated that Germany's participation in the world's foreign trade in electrical products advanced from 28 per cent. in 1929 to 30 per cent. in 1930. At home, however, orders were in some cases as much as 40 per cent. below the level of the preceding year, and most firms complained of the reduced prices forced upon them.

In 1930 the rise which had been continuous since 1925, at least in the production of electricity, was interrupted, and the figure for January to June, 1931, was 12 per cent. below that for the first half of 1930. The progressive development until 1929 was due to the rationalisation of German industry together with a large scale erection of modern dwellings; the setback since then has been caused by the general depression in German economic life. The consumption of power for non-industrial purposes is less than in other countries.

All works have been more or less faced with the difficulty that they have not been able to make use of their plant to its full capacity which in recent years has been extended in anticipation of a further rise in the demand. The price of electricity was lowered in a number of districts.

Wages and Employment

In view of the recent Emergency Decree aiming at a general reduction of 10 per cent. in prices and wages, it is interesting to recall that in 1930 a general lowering of the German wage level set in. It began with the cancellation of all sorts of bonus payments and led to a reduction of the income of the working population, which the trade unions estimate at about 10 per cent. The Commercial Officers remark that while complaints about high wages may well be unjustified in Germany, it is admitted that the contributions towards social insurance are a heavy burden on both the employer and the employed.

A general indication of the trend of wages during the past few years can be gained from tabular statements given in the report. They are the average tariff rates in pfennig in the groups of industries named:—

	Metal Industry.		Building Trade.	
	Skilled.	Unskilled.	Skilled.	Unskilled.
Jan. 1, 1927	87.6	61.6	116.4	93.7
„ 1, 1928	96.2	69.4	125.4	102
„ 1, 1929	100.6	75.0	134.4	111
July 1, 1929	102.8	77.1	140.6	115.8
Jan. 1, 1930	103.3	77.4	140.9	116.1
July 1, 1930	103.3	77.4	141	116.2
Jan. 1, 1931	101.2	75.6	141	116.2

The report shows how economic depression has grown. Some of the statistics given are not very recent, but it is interesting to note that in industry and handicrafts the number of persons employed in the middle of 1930 was 15.3 per cent. less than twelve months before. Amongst these, workers in the electro-technical, fine-mechanical, and optical group of industries declined by 13.8 per cent., and those in electricity, gas and water production by 4.8.

In the middle of 1930 unemployment totalled about 3,000,000. The figure is now about 5,500,000. Obviously therefore up-to-date statistics relating to the various groups of industries would show a big advance in the foregoing percentages.

Anglo-German Trade

The striking development of Anglo-German trade in favour of Germany is indicated in the following tables which are included in the report. The post-war figures relate to Britain and Northern Ireland only:—

	Imports into Germany from Britain.	Exports to Britain from Germany.
	Mks.	Mks.
1913	875,859,000	1,438,225,000
1927	963,066,000	1,177,517,000
1928	893,781,000	1,182,386,000
1929	865,357,000	1,305,522,000
1930	639,001,000	1,218,884,000

The exchange of gold and silver during the same period was:—

	From Britain to Germany.	From Germany to Britain.
	Mks.	Mks.
1913	207,335,000	12,912,000
1927	52,666,000	211,000
1928	401,591,000	3,680,000
1929	345,697,000	18,496,000
1930	288,447,000	5,003,000

German imports from Great Britain fell by about 25 per cent. in 1930, while exports to Great Britain decreased by only 7 per cent. British purchases of German goods were almost double the value of British goods exported to Germany. The balance in Germany's favour during the past four years has risen from 214,000,000 m. (about £10,700,000) to 580,000,000 m. (about £29,000,000).

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The E.D.A. February Programme

In the February programme of the British Electrical Development Association further attention is drawn to the new 16-sheet poster which the Association has recently produced. A scheme for floodlighting poster hoardings is being prepared, and details will be published in the March programme.

Special attention is drawn to the electric furnace campaign which is being conducted during the first half of the current year. This campaign, which has been organised by the Association in conjunction with the Furnace Makers' Section of the Industrial Electric Heating Committee, has been arranged to popularise electric furnaces, and members who have potential users of electric furnaces in their areas are urged to collaborate and also to plan and carry out local campaigns.

The E.D.A. February window display

Advertisements which will appear in the London Press are reproduced, and the Association is directing its propaganda to boards and financial controllers, as the furnace manufacturers are of opinion that their own publicity and selling organisations deal adequately with works managements. A special poster has been prepared to link up with the campaign.

The window display for the month, which we illustrate, is a special display of electric fires and blankets, the material for dressing the window being obtainable from the Association. A price list of publications for February is given, and all the usual monthly features are included.

Sales Conferences

The sales conferences for next month arranged by E.D.A. are as follows:—London, February 19th, "The Essentials of Salesmanship," by Mr. W. Attwood; North Counties Area, February 4th, at Newcastle-upon-Tyne, "Selling Talk—My Experiences on the Road," by Mr. J. Newcombe; North Midland Area, February 3rd, at Bradford, "Home Lighting," by Miss D. Noakes.

Agricultural Exhibition at Ormskirk

An exhibition of electrical agricultural equipment and implements was held last week at Ormskirk, having been arranged by the Lancashire Electric Power Co., which supplies electricity in the neighbourhood. In addition to domestic appliances there were on view portable motors, electric soil-heating plant, incubators and brooders, and dairy plant.

A Lamp Fraud

Before the Common Serjeant (Sir Henry Dickens, K.C.) at the Central Criminal Court on January 13th, Rudolph E. D. Stanley, a lamp agent, and Sidney Stanley, a traveller, pleaded not guilty to an indictment containing sixteen counts charging them with having in their possession lamps and wrappers to which a false trade mark had been applied. They were also charged with obtaining money by false pretences from various shopkeepers, and with having in their possession a stamp for the purpose of forging a trade mark.

Mr. L. A. Byrne, who prosecuted, said that the accused sold foreign electric lamps to shopkeepers as "Osram" lamps. "Osram" was a registered trade mark owned by the General Electric Co., Ltd. The defendants forged the name "Osram" on wrappers and on the lamps, and the latter were then sold to unsuspecting shopkeepers as genuine "Osram" lamps. The last count of the indictment charged them with selling foreign or inferior lamps as "Siemens" lamps. In a statement made to the police by the elder defendant, he asserted that he bought unstamped lamps from a man named Landau, together with some rubber stamps for putting on the trade mark.

Mr. Augustus Adams, factory superintendent, employed by the General Electric Co., Ltd., said he had examined the lamps sold by the defendants; they were not made by the G.E.C. and his company did not make an unstamped lamp.

At the close of the case for the prosecution, the Judge said there was no case against Sidney Stanley; the jury found him not guilty, and he was discharged. The other defendant, from the witness box, said that he had been travelling in lamps for several months. Landau told him that the lamps he could buy were genuine "Osram." Landau said that he wanted to realise on them and buy some more stuff. He also said that the lamps were "Osram" seconds and at first asked 21s. per dozen for them. It was eventually agreed that he should have them at 18s. per dozen.

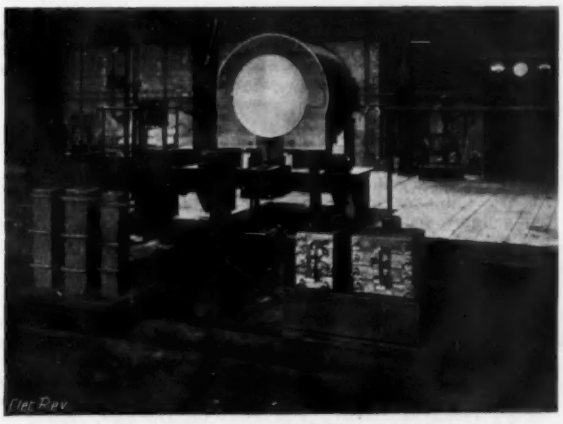
Stanley was found guilty on all counts, and it was then stated that the accused's real name was Rubenstein and that he had been previously convicted of fraud. The Common Serjeant imposed a sentence of six months' imprisonment in the second division.

Czecho-Slovakian Electrical Trade

During November last the value of imports of electrical machinery and apparatus into Czecho-Slovakia amounted to 28,320,000 crowns, bringing the total value for the first eleven months of 1931 to 345,279,000 crowns. The value of exports of electrical machinery and apparatus during the same periods of 1930 was 27,933,000 and 283,555,000 crowns, respectively.

G.E.C. Furnace Agreement

The General Electric Co., Ltd., has concluded an agreement with Mr. Victor Stobie by which it acquires the sole rights to manufacture and sell within the Empire high-frequency induction type electric furnaces in accordance with his patents. These furnaces offer many important advantages for the production of high-grade steels and the melting of ferrous and some non-ferrous metals and alloys, and differ from other high-frequency furnaces in that they are not of the coreless type but are partially cored. The path for the magnetic field is mainly through thin laminations of high-silicon low-carbon steel. This alloy steel magnetic path is brought to a central



A 6-cwt. "Witton" high-frequency induction furnace

position right inside the axis of the inductor coil. The result is that, instead of a magnetic field weakened by air resistance and uncontrolled as regards its distribution within the crucible, the electro-magnetic system enables so strong and centrally situated a magnetic field to be available in the crucible for inducing the current in the charge, that it has been possible for the remainder of the electrical equipment to be made entirely subservient to considerations of safety and efficiency. In our illustration we show a 6-cwt. model at the end of the pour.

F.B.I. Statement of Policy

At its recent quarterly meeting the Grand Council of the Federation of British Industries reviewed the national position and the policy of industry in relation to it. It was agreed that no change had occurred in the situation which altered the views of industry as to the steps which were required to restore prosperity, and that it was necessary to adopt a national economic policy covering certain points vitally affecting the prospects of industrial recovery. The fundamental principles of such a policy, the Federation considers, are:—(*a*) A new spirit of economy in our internal government, covering administration, taxation and expenditure, with the object of restoring the competitive efficiency of the country; (*b*) a new fiscal system; and (*c*) a financial, monetary and investment policy mainly directed towards the restoration of industry and to the development of markets for British goods.

Transport Workers' Wages

The management of the "Underground" Group met representatives of the three railway unions on January 18th to discuss proposals for a temporary reduction of the wages of all grades on the underground railways. An official statement issued intimates that the position of the companies was put before the unions, who in turn asked for certain information. The meeting was adjourned in order that the information might be prepared and circulated, and the discussion will be resumed on February 1st.

A meeting of the National Joint Industrial Council for the Tramway Industry was held on January 14th, when a Committee of Investigation was appointed from both sides to discuss wages and conditions consequent on the notice given by the employers of the termination of existing agreements.

Vacuum Cleaners for Ethiopia

We learn that the suite of the Crown Prince of Ethiopia has ordered "Sunbeam" electric vacuum cleaners for 32 and 101 volts for use in Adis-Abeba, the capital of Ethiopia. There is no public supply in Adis-Abeba, the various palaces of eminent personages having their own private installations. The order in question has been placed with Mr. F. H. Katz, who is manufacturing the "Sunbeam" cleaners in London.

British Refrigerators for Hong Kong

A new field for British refrigerators is being opened up by Marco Refrigerators, Ltd., who have arranged for a shipment of refrigerators to Hong Kong and Zanzibar, a market hitherto enjoyed almost exclusively by foreign firms. A number of improvements have recently been effected in "Marco" refrigerators and the "Free-Draught" evaporator has been produced which is claimed to be the only one in existence giving positive air circulation.

Appointments of Agents in Tunisia

A confidential memorandum on the appointment of agents in Tunisia prepared by H.M. Consul-General at Tunis has been received and circulated by the Department of Overseas Trade to firms whose names are entered on its Special Register. British firms wishing to obtain a copy should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference number C.X.3774.

Lighting Engineers' Exhibition

In connection with the annual conference of the Association of Public Lighting Engineers, which is to be held at Blackpool from September 5th to 8th, it is proposed to arrange an exhibition of public lamps and lighting appliances. A meeting of the prospective exhibitors will be held at the Holophane Lecture Theatre, Elverton Street, Vincent Square, S.W.1, on January 29th. Firms who are desirous of exhibiting but have not yet received an invitation to this meeting should communicate with the honorary secretary (Mr. J. S. Dow), 32, Victoria Street, S.W.1.

Wages in the Cable-making Industry

We are informed by the Joint Industrial Council for the Electric Cable-making Industry that the January 1st cost-of-living figure was 47 per cent. above the 1914 level and there will consequently be no alteration in wages on the third pay day in February.

Railway Electrification in Brazil

Reuter's Trade Service learns from Rio de Janeiro that the Government has postponed until April 30th the examination of tenders for electrification of the Central of Brazil railway, the scheme now covering conversion of all the broad-gauge lines of the national railway near Rio de Janeiro, from the central terminus (Pedro II station) to Deodoro, Barra-do-Picahy, Santa Cruz, Paracamby and Maritima. A commencement will be made with the electrification of about ninety miles of main line in addition to the suburban lines already decided upon. The work involves the development of power from the Federal-owned waterfalls at Mambucoba and Salto, and considerable purchases of rolling stock are contemplated. The total value of the construction contract is estimated at £2,900,000. Further particulars can be obtained from the Inspectoria Federal das Estradas, Ministerio do Viacao e Obras Publicas, Rio de Janeiro. Several French, Swiss, German and American firms are expected to tender. Successful contractors will be asked to accept remuneration in the form of 30 half-yearly instalments covering interest and amortisation. For this purpose the Government will annually maintain in the Budget the present appropriation for the purchase of fuel, 25 per cent. of which amount will be equivalent to the economy effected in fuel used on the lines to be electrified, and will be employed for amortisation and interest on the capital invested in the electrification.

Franco-German Electrical Co-operation

The Office Franco-Allemand de Matériel Electrique has been formed in Paris with a capital of 100,000 fr. as the executive office for the agreement which was recently arrived at between the German and the French electrical industries concerning the division of export markets. The A.E.G. and the Siemens-Schuckertwerke are the German companies concerned, while the French participants are the Alsthom, the Forges et Ateliers de Jeumont, the Compagnie Electro-Mécanique, the Constructions Electriques de France, the Compagnie Générale d'Electricité, and Le Matériel Electrique.

Negotiations are reported to have recently taken place between the German Wireless Industry Union (Verband der Funkindustrie) and leading French radio undertakings with the object of reaching an agreement in the matter of various patent questions. The discussions, however, were broken off without the result which was aimed at being obtained. In the present case the matter is said to have concerned high-frequency amplifiers.

Threatened Engineering Lock-out

A lock-out affecting 91,000 men in the engineering industry and iron works was declared last week by the Swedish Employers' Union. The lock-out is to come into force on January 24th unless the dispute is settled on the terms already accepted by the Employers' Union.—*Reuter* (Stockholm).

Polish Import Prohibitions

By a Decree of December 21st the imports of certain goods into Poland are prohibited, although it is understood that the goods affected may be admitted without restriction during January and February in quantities up to a total of 10 per cent. of the imports during January to March, 1931. The list of goods includes insulated electric cables and wires, dynamos, motors, transformers, convertors, electrical machines, not specially mentioned in the tariff, accumulators and plates therefor, electrical apparatus and instruments, electric incandescent lamps, mounted, material for electrical installations and apparatus for wireless telegraphy. The prohibition is valid during the year 1932.

Patent Action Settled

In the Chancery Division on January 13th, Mr. Justice Bennett had in his list for trial an action by the Chloride Electrical Storage Co., Ltd., against the National Radio Co., London, E.

Counsel for the plaintiffs said that it was a patent action, alleging infringement by selling below the authorised price. The parties had come to terms, the defendants agreeing to submit to an injunction which was all that the plaintiffs were now asking for. His Lordship made an Order accordingly.

Paisley Electrical Employés' Claims

Following upon the taking over of the Paisley electricity undertaking by the Central Electricity Board, seventeen employés lost their situations, and claims were made for compensation. It has been reported to the Corporation that Sir Harold Morris has issued his award, which amounts in total to £2,066.

Increased Estonian Duties

Increased customs duties have been imposed on certain goods imported into Estonia, with effect from December 12th. These duties include an increase from 0.75 to 1.50 Estonian kronen per kg. net on electrical apparatus and accessories not specially mentioned in the tariff, including heating, drying, signalling, and similar apparatus, and electric irons.

The Insurance of Electrical Plant

A correspondence course in the insurance of electrical plant has been prepared by the National Institute of Specialised Engineering, Manchester. Details of the course are given in an advertisement appearing in this issue.

In Aid of the E.T.B.I.

Once again the Bouverie Players' Society has come to the aid of the Electrical Traders' Benevolent Institution, the play chosen this year being "Murder on the Second Floor," by Frank Vosper, which was given at the New Scala Theatre on Tuesday last. Mr. Gordon Grieve as "Hugh Bromilow," a playwright, had a difficult part and played it with sincerity, while Mr. Harry Duck as "Joseph Reynold," a commercial traveller, and Mr. George Schreiber as "Mr. Armitage," the landlady's mild husband, and Mr. William McNaught, as "Jam Singh," an Indian student, all played their parts convincingly. Of the ladies, first mention should be made of Miss Elsie Dennis's excellent performance as "Miss Snell," an elderly spinster. The smaller parts were also well sustained. The play was enthusiastically received by a crowded house, and the Institution should benefit substantially.

Social Events

The annual staff dinner of the British Institute of Engineering Technology was held on January 14th at Frascati's, Mr. Cleaver presiding. As dancing was to follow, the speeches were commendably brief. Mr. F. Magill proposed the toast of "The Firm," and Mr. T. Aubertin, the principal, in responding, stated that during 1931 approximately 9,000 students were enrolled. Sir Robert Dibdin proposed "The Ladies" in a humorous speech and Mr. Graham Moore responded. Mr. Hal Hill proposed "The Chairman," and Mr. Cleaver, in his reply, said that the Institute had many thousands of students in all parts of the world. After dinner, the floor was cleared and a pleasant evening was concluded with dancing.

On Saturday last the Enfield Cable Works, Ltd., held its sixth annual staff dinner and dance at the Midland Grand Hotel, London. Responding to the toast of "The Company," the Earl of Verulam (chairman) referred to some of the most outstanding events during the past year and mentioned the extension of the rolling mill and the paper read by Dr. Bowden

on gas pressure cables. There were sound reasons, he said, for supposing that 1932 would be a good year for England and the company. Among other speakers were Messrs. D. A. S. Porteous, F. D. Brown, D. Duncan Smith, and F. Plutte. A dance followed the dinner, music being provided by the Sommerfield Orchestra; Messrs. H. B. Davies and C. W. Pardey acted as M.C.s. Mr. F. C. Tibbatts and the committee are to be congratulated on the complete success of the evening.

A.S.E.A.'s 50th Anniversary

The Allmänna Svenska Elektriska Aktiebolaget (Swedish General Electric Co.), known as the A.S.E.A., will soon celebrate its fiftieth anniversary.

Factories for England

At a meeting of the London Chamber of Commerce on January 13th it was stated that arrangements had been completed for a number of foreign companies to set up factories in England. These factories included one for the manufacture of batteries and electrical equipment on Merseyside for a German firm, which would at first employ 800 people, and a German factory at Slough to manufacture electrical accessories, where 2,000 people would be employed.

Home and foreign manufacturers contemplating the establishment of new factories should find the attractively produced and well-illustrated 31-page booklet bearing the above title, issued by the Welwyn Garden City Information Bureau, of considerable interest. It sets out the chief factors which need consideration when establishing manufacturing plant. Situation, design, construction, equipment, power supplies, transport, labour, housing, &c., are all dealt with briefly.

American Activities in Canada

Recently many American manufacturers of electrical goods have established branch plants in Canada in order to obtain the advantage of the British preference in their export trade with British Empire countries. The Arrow-Hart and Hegemann Electric Co. of Hartford (Conn.), one of the largest manufacturers of electric wiring and switch devices in the world, has established a Canadian branch to be known as the Arrow-Hart and Hegemann (Canada), Ltd., and is equipping a plant in Toronto which is expected to be in operation by February 1st. About forty persons will be employed and the material used will be practically all Canadian.

A " Hoover " Factory

Messrs. Hoover, Ltd., are to transfer the manufacture of their vacuum cleaners for the British and European markets from Hamilton, Ontario, to a new factory to be erected at Perivale, Middlesex. The new building will adjoin the new offices to which the company moved at the beginning of this month, and will provide employment for over 500 men. Work on the erection of the building will commence immediately.

Calendars

" Simply Perfect," a picture of a captivating damsel in an economically designed gown of pink taffeta, graces the attractive calendar of the Metropolitan-Vickers Electrical Co., Ltd. Daily slips with quotations are provided.

A celluloid pocket calendar with inches and centimetres marked round the edge has been received from the Key Engineering Co., Ltd.

A parody of Kipling's " If " appears on a neat calendar sent us by Bell's Asbestos & Engineering Supplies, Ltd.

Importation of Wireless Apparatus into France

The *Journal Officiel* has published a notice of the Ministry of Commerce to importers of wireless valves. The quotas fixed for the period January 1st and March 31st, 1932, inclusive, allow Great Britain 3,400 kg. of wireless valves out of a total of 15,000 kg. allowed per month. For wireless apparatus, out of a total of 154,100 kg. allowed to be imported, 4,600 kg. is allotted to Great Britain.—*Reuter* (Paris).

French Electrical Imports and Exports

The official returns lately issued show that the value of the electrical machinery, apparatus, and cognate goods into France during the nine months ended with September last attained a value of £3,587,800 as compared with £4,609,060 in the corresponding nine months of 1930. There was also a decline during the same period in the value of the exports of similar material from France—from £3,124,740 to £2,524,920.

New French Companies

Among companies recently formed in France are the Société Deliot & Cheminat, Paris (12, Rue de Palestine), to manufacture electric furnaces; La Société des Lampes de France, Sevres (21 bis, Rue du Docteur Gabriel Ledermann), to manufacture electric lamps; La Société Union Sonore Européene, Paris (55, Avenue des Champs Elysées) to manufacture radio apparatus and to enter into an agreement with Mr. Malcolm Lyon, London, and M. K. Kaplan, Paris; and La Société d'Etudes pour la Valorisation de l'Energie par Accumulation, Paris (19, Rue Louis Murat).

For Sale

The London County Council invites tenders for the purchase of a 5,000-kW turbo-alternator with condensing plant, &c.

Electrical equipment and printing machinery will be sold by auction on January 26th by Mr. S. J. Baker at the premises of the Premier Linotyping and Printing Co., Ltd., Figgins Buildings, Ray Street, E.C.1.

Salford Electricity Department has for sale a battery, booster and control equipment.

(See our advertisement pages to-day.)

New Worthing Showrooms

The new electricity showrooms established by the Worthing Corporation at Connaught Buildings, Chapel Road, will be opened on January 25th by the Mayor, Alderman F. A. Watts.

Recent Contracts

Standard Telephones & Cables, Ltd., have received an order for a three-channel carrier telephone system for Russia to be installed between Moscow and Sverdlovsk. They have also received an order from the General Post Office for a telephone repeater station for Stranraer, Wigtownshire, the equipment for which comprises 20 four-wire repeaters, five broadcast repeaters and associated apparatus.

The General Electric Co., Ltd., has received orders from the Dublin Port and Docks Board and the Great Northern Railway Co. of Ireland for a supply for one year of " Osram " lamps, and from the Union Castle Mail Steamship Co., Ltd., for a supply of lamps for six months.

The Brush Electrical Engineering Co., Ltd., has received an order from the Birmingham Corporation for four 6,500-kVA, 3-phase, 50-cycle transformers, outdoor type, ratio 10,750/5,250 V, provided with off-load tapping switches. These are for the Fort Dunlop sub-station.

An order for switchgear of the horizontal metal-clad type for the control of the main 33,000-V feeders of Copenhagen has been placed by the City Lighting Department with Messrs.

Reyrolle switchgear in a Copenhagen sub-station

A. Reyrolle & Co., Ltd. The order was placed, without competition, on the record of similar equipment supplied by Messrs. Reyrolle a few years ago, which is to be seen on the right-hand side of the accompanying illustration of the sub-station where the new switchgear will be installed.

New Swiss Company

A new company with the title of the Escher Wyss Maschinenfabrik Gesellschaft has been formed in Zurich to take over and carry on the Swiss engineering business hitherto known as Escher Wyss & Co.

Trade Announcements

British Electric Lamps, Ltd., Wimbledon, have opened a new branch at 12, Eldon Square, Newcastle, where large stocks of all types of lamps are held. The telephone number is Newcastle 24903.

Owing to the increasing demand for " Linolite " equipment, Messrs. A. W. Beuttell, Ltd., have opened a branch office and stores at 172, Edmund Street, Birmingham, under the management of Mr. L. J. Gellion. The telephone number is Birmingham Central 6783.

The Wallace Electrical Co. has taken over the entire electrical department of Messrs. A. Emanuel & Sons, Ltd., at 9 and 9a, George Street, Manchester Square, W.1, and will continue to specialise in the design and manufacture of fittings for cinemas, &c. Mr. Greenfield, who has been for many years with Messrs. Emanuel, will continue in charge of the department.

Electric Art Shades (1928), Ltd., have opened a new London showroom at Cathedral House, 8, Paternoster Row, E.C.4, where are displayed a wide selection of lamp shades of all types, a great many of which are entirely new in design and style. The telephone number is City 4424.

Mycalex (Parent) Co., Ltd., has removed to 337, Thames House, Millbank, S.W.1; telephone, Victoria 1827/8/9.

Messrs. Richard A. Wheatley (1931), Ltd., have moved to Brook Road, Wood Green, N.22. The new telephone number is Mountview 6337.

Mass Products, Ltd., has removed to Thames House, Millbank, S.W.1.

Messrs. Adams & Barlow, dealers in electrical goods, have opened premises at 11, Station Parade, Wanstead, Essex.

The firm of J. H. Heathman has been converted into a limited company, and is now known as J. H. Heathman, Ltd. The registered office is at 18, Heathman's Yard, Parson's Green, S.W.6. Telephone: Fulham 0151.

" Chromalox " at the B.I.F.

The name of Messrs. Geo. Bray & Co., Ltd., of Leeds (" Chromalox " electric water heating and other products), should have appeared in our list of exhibitors last week. They have a much larger stand than in previous years.

New Catalogues and Lists

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.1.—A pamphlet giving details of the "N.C." resistance wire manufactured by Bruntons (Musselburgh), Ltd., for whom the company is the sole representative.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A leaflet on automatic control gear.

Church & Collis, Ltd., Queen Street, Chelmsford.—An illustrated and priced pamphlet giving particulars of the construction and assembly of electric forcing frames for seedlings and plants.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.—An illustrated pamphlet describing "Ankaflex" flexible cord for portable electrical appliances.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Publication No. 7022/0, describing the company's complete range of single-phase motors and starters.

Hopkinsons, Ltd., Huddersfield.—List No. 3201 dealing with steam traps.

Baxter & Caunter, Ltd., 221, Tottenham Court Road, W.1.—An illustrated catalogue (No. 62) of electrical accessories.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A folder (No. F.4815) on the "Gecoray" system of shop-window lighting.

J. C. White & Co., Ltd., 49, Bridge Street, Deansgate, Manchester.—An illustrated leaflet, giving particulars of the "J.C.W." wiring system, shock-proof and corrosion-proof lighting accessories, hand lamps, &c.

Frys (London), Ltd., 24-25, King Street, Minories, E.1.—Prices and particulars of "Enox" hack-saws.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—List No. 164, showing a new range of recorders of the tape chart type.

Simplex Conduits, Ltd., Garrison Lane, Birmingham.—A leaflet dealing with the company's new S.E.S. "Black Prince" range of ironclad switchgear.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The January issue of the "Wigan Review," containing particulars of the "Wigan" flameproof push button.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Holloway, N.7.—An illustrated leaflet describing a new electric furnace with forced air circulation and automatic charge progress recorder.

Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, S.W.1.—An illustrated and priced catalogue of automatic coil winders.

Electric Art Shades (1928), Ltd., Kelvedon, Essex.—A leaflet showing some of the company's latest shades and table standards.

Bell's Asbestos & Engineering Supplies, Ltd., Bestobell Works, Slough.—A 548-page catalogue covering the whole of the company's asbestos and engineering products. Illustrated and priced.

Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, W.4.—A leaflet relating to the "Dionic" water purity meter (salinometer).

Bankruptcy Proceedings

T. H. Buxton, electrical engineer, 80, Bradford Road, Tingley, Yorks.—The public examination was held recently at the Court House, Wood Street, Wakefield. A statement of affairs which was submitted showed liabilities amounting to £802, against assets of £5. Debtor attributed his failure to lack of capital; bad trade due to the general depression; and losses on contracts. He stated that he commenced business in July, 1926, with a capital of £20 his own and £50 which he borrowed from his father. Debtor was questioned at considerable length and finally the examination was adjourned *sine die*.

S. L. Holt, electrical and radio engineer, 46, Highland Terrace, Uffculme.—Receiving order made January 12th on debtor's own petition.

W. Sutcliffe, electrical engineer, 40a, Old Church Street, Oldham.—Receiving order made January 12th on debtor's own petition. First meeting January 22nd, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, February 16th, at the Court House, Church Lane, Oldham.

Movitone Radio Co., radio dealers, 660a, Holloway Road, N.—First meeting January 25th and public examination April 15th, both at Bankruptcy Buildings, Carey Street, W.C.

J. L. Goldsman, radio engineer, 100, High Holborn, W.C.—Discharge suspended for six months until June 17th.

D. L. Gibson, wireless retailer and manufacturer, 31-33, Westgate Road, Newcastle-upon-Tyne.—Trustee, Mr. R. M. Graham, 2, Saville Place, Newcastle-upon-Tyne, appointed January 11th.

J. Tucker (Bristol Radiator Co.), wireless dealer, 30, Lower Ashley Road, Bristol.—Trustee, Mr. J. D. Turner, 26, Baldwin Street, Bristol, Official Receiver, released December 30th.

W. Mann, wireless dealer, 32, Briton Street, Leicester.—Trustee, Mr. E. Barlow, 1, Berridge Street, Leicester, Official Receiver, released December 16th.

W. V. Owen, electrical engineer, 1, Church Street, Tremadoc.—Trustee, Mr. I. D. Hooson, St. Peter's Churchyard, The Cross, Chester, Official Receiver, released December 30th.

H. Roberts, electrical engineer and contractor, 41, Bloxcidge Street, Langley, Oldbury.—First and final dividend of 1s. 9¾d. in the £, payable January 22nd at the Official Receiver's office, 191, Corporation Street, Birmingham.

Yeoman & Greig, electrical goods agents, 4, North End Road, Golders Green, N.—Receiving order made January 7th on a creditor's petition. First meeting January 21st, and public examination March 8th, both at Bankruptcy Buildings, Carey Street, W.C.

C. G. Smith, electrical contractor, 66, Lichfield Street, Wolverhampton.—Receiving order made January 6th on debtor's own petition.

P. H. Fawbert, wireless dealer, 81, Dickson Road, Blackpool.—First meeting January 21st at the Official Receiver's office, 9, Cannon Street, Preston. Public examination February 5th at the Court House, South King Street, Blackpool.

A. W. Creasey (Essex Electrical Storage Co.), engineer, Foundry House, Hall Lane, Walton-on-Naze.—Trustee, Mr. R. A. Rodgers, Coventry House, South Place, E.C., appointed January 6th.

W. R. Blakeway (Pearson & Co.), electrical contractor, 31, High Street, Southampton.—Trustee, Mr. H. W. Miles, 44, Above Bar Street, Southampton, appointed January 7th.

S. Watson & E. Guest (Bodmin Motor & Electrical Co.), Park Garage, Bodmin.—Last day for receiving proofs for dividend, January 30th. Trustee, Mr. C. E. B. M. Smith, 1, Athenæum Terrace, Plymouth.

H. Nutter, electrical engineer, 246, Yorkshire Street, Rochdale.—Supplemental dividend of 5s. 11¾d. in the £, payable January 18th at the Official Receiver's offices, Byrom Street, Manchester.

Company Liquidations

Bury Lighting & Heating Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. Chadwick, 16, Bolton Street, Bury.

Darlington Dry Battery Co., Ltd.—Particulars of claims by January 30th to the liquidator, Mr. V. W. Heslop, 39, Priestgate, Darlington.

R. B. Heckie & Co., Ltd.—Meeting, February 8th, at 19, St. Vincent Place, Glasgow, to receive an account of the winding-up by the liquidators, Mr. D. S. Hepburn and Mr. J. Bowes, Jnr.

Max Behr & Co., Ltd.—Meetings February 15th at Vernon House, Sicilian Avenue, Bloomsbury Square, W.C., to receive an account of the winding-up by the liquidator, Mr. J. G. P. Ibotson.

Dissolutions of Partnerships

Jarrett & Co., electrical engineers, &c., 53, High Street, Reigate.—Messrs. H. J. Jarrett and T. F. Jarrett have dissolved partnership. Mr. T. F. Jarrett will attend to debts and carry on the business.

Hughes & Erskine, electrical accessories dealers, 68, Hudson Street, Preston.—Messrs. R. Erskine and T. H. Hughes have dissolved partnership. Mr. Hughes will attend to debts and carry on the business.

Premier Electrical Co., electrical and radio engineers, 48, Grosvenor Road, Tunbridge Wells.—Messrs. A. C. Watts and A. T. Spurrell have dissolved partnership. Mr. Watts will attend to debts and carry on the business.

Private Arrangement

R. D. Lewis (trading as R. D. Lewis & Co.), electrical engineer, 72, Wallasey Road, Wallasey.—A meeting of creditors was held on January 13th, when the statement of affairs showed liabilities of £968 and net assets of £90, leaving a deficiency of £878. The creditors decided that the debtor should endeavour to obtain financial assistance for the purpose of paying a composition of 5s. in the £.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price Jan. 20th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic .. .. per lb.	5½d.	—
a	Ammoniac, Sal .. .. .. per ton	£60	—
a	Ammonia, Muriate (large crystal) .. „	£52	—
a	Borax .. .. „	£17	—
a	Copper Sulphate .. .. .. „	£25 10s.	—
a	Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a	„ Perchlorate .. .. .. „	5½d.	—
a	Shellac T.N. .. .. .. per cwt.	£4 5s.	—
a	Sulphur Commercial .. .. .. „	£11	—
a	„ Roll .. .. „	£11	—
a	Soda, Chlorate .. .. per lb.	3d.	—
a	„ Crystals .. .. per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks .. .. per lb.	4d.	—
	METALS, Etc.		
b	Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b	„ Wire .. .. .. per lb.	1/1 to 1/9	—
b	„ Sheet and Foil .. .. „	1/1½ to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I .. .. per ton net	£134	£4 inc.
	Grade II .. .. „	£95	£2 inc.
	Grade III .. .. „	£54	£1 inc.
c	Brass (rolled metal 2" to 12" basis) .. per lb.	8d.	—
c	„ Tubes (solid drawn) .. .. „	10d. to 10½d.	—
c	„ Wire, basis .. .. .. „	8½d.	—
c	Copper Tubes (solid drawn) .. .. „	11½d.	—
g	„ Bars (best selected) .. .. per ton	£77	—
g	„ Sheet .. .. „	£77	
g	„ Rod .. .. „	£77	
g	„ (Electrolytic) Bars .. .. „	nom.	—
d	„ „ Sheets .. .. „	nom.	—
d	„ „ Wire Rods .. .. „	nom.	—
d	„ „ H.C. Wire .. per lb.	7½d.	½d. dec.
	Ebonite Rod .. .. „	1/3 to 1/6	—
f	„ Sheet .. .. „	1/3 to 1/6	—
n	German Silver Wire .. .. .. „	2/2	—
h	Gutta-percha, fine .. .. .. „	nom.	—
h	India-rubber, Para fine .. .. „	4½d.	—
i	Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
i	„ Wire, galve. No. 1, P.O. qual. „	£20	—
g	Lead, English pig .. .. .. „	£16 5s.	5s. dec.
g	Mercury .. .. per bot.	£18 5s. to £18 10s.	15s. to £1 dec.
e	Mica (in original cases) small .. per lb.	6d. to 3/6	—
e	„ „ medium .. „	4/- to 8/-	—
e	„ „ large .. „	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings .. „	1/1½d.	—
p	„ „ drawn bars & rods „	11½d.	—
p	„ „ rolled strip & sheet „	1/-	—
p	„ „ wire .. .. „	1/1½d.	—
o	Platinum .. .. per oz.	£11	6s. dec.
d	Silicium Bronze Wire .. .. .. per lb.	8½d.	½d. dec.
r	Steel, magnet, in bars .. .. „	7½d.	—
g	Tin, Block (English) .. .. .. per ton	£142 10s. to £144 10s.	£3 15s. inc.
n	„ Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Electricity Supply

Lighting, Domestic, Power

Anglesey.—ELECTRICAL DEVELOPMENT SCHEME.—A committee has been formed to promote the consumption of electricity throughout Anglesey. A supply of electricity from the North Wales Power Co., Ltd., will be available at Holyhead on February 1st.

Ashford (Kent).—EXTENSIONS TO WESTWELL AND SHADOXHURST.—The Urban District Council has received sanction to a loan of £6,280 for mains extensions to Westwell and Shadoxhurst.

BULK SUPPLY DIFFICULTIES.—No satisfactory arrangements have yet been made with regard to a bulk supply and the Electricity Committee has informed the Electricity Commissioners that the position next winter will not be satisfactory without a bulk supply or new generating plant.

Barnes.—NEW FEEDER.—The Urban District Council has decided to have a new feeder cable laid from the power station to a point near the junction of Clifford Avenue and Lower Richmond Road at an estimated cost of £1,800.

Bedford.—EXTENSIONS.—The Corporation is to extend l.p. lines in the parishes of Renhold, Roxton, Ravensden, Wilden, Kempston Rural, and Turvey.

LOANS.—Sanction is being sought to loans of £11,000 for the completion of the rural distribution system, and £3,143 for the supply of electricity to Old Warden and Southill.

Bournemouth.—ELECTRICITY BILL.—The Bill providing for the extension until 1942 of the lease to the Bournemouth and Poole Electricity Supply Co. of the supply powers for the district has now been deposited.

Bridlington.—OVERHEAD LINES IN HUNMANBY AREA.—The Rural District Council has decided to offer no objection to the use of overhead mains in the Hunmanby area by the Buckrose Light and Power Co., Ltd. The question of whether a supply of electricity can be made available for the residents of Flamborough will shortly be considered by the company.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—A report issued by the Dominion Minister of the Interior states that new hydro-electric installations brought into operation in 1931 totalled 546,650 h.p., and capital to the extent of $110,000,000 is estimated to have been spent on that development. This increases Canada's total hydro-electric development to 6,666,000 h.p., after allowing for several replacements of old by new turbines. In addition, construction was advanced during the year on a number of schemes, and it is expected these will add more than 1,400,000 h.p. to the Dominion water power development in the next two or three years. More than $280,000,000 will be required to bring these schemes to completion.

ST. LAWRENCE POWER SCHEME SET-BACK.—Plans for joint Canadian-United States development of the St. Lawrence River to provide hydro-electric power and to give ocean-going vessels access to the head of the Great Lakes received a severe set-back on January 15th when the Quebec Legislature adopted a resolution opposing immediate action on the scheme by a majority of 54 votes to 7. The result of the voting was a foregone conclusion after a vigorous attack on the scheme made by the Quebec Premier, Mr. Taschereau, who condemned it as being costly and in his opinion detrimental to the interests of the port of Montreal and the Province of Quebec. As the result of the vote the whole project may be indefinitely postponed.—*Reuter* (Quebec).

EXTENSIONS TO PAUGAN PLANT.—The Gatineau Power Co. has completed the installation of the seventh 34,000-h.p. generator in its Paugan, Quebec, hydro-electric plant. With the addition of this unit the station now has an installed capacity of 238,000 h.p., and ranks as one of the largest hydro-electric generating stations in North America.

Canterbury.—PROPOSED EXTENSION OF SUPPLY AREA.—The City Council is having a report prepared respecting an application for an Order to extend the electricity supply area.

Coatbridge.—THE FUTURE SUPPLY.—A new development has occurred with regard to the question of the future supply of electricity for Coatbridge, and the matter has now been remitted to a referee—the Sheriff-Principal of Lanarkshire, or failing him, the Sheriff-Substitute of Airdrie—to report to the Council whether the offer of the Clyde Valley Electrical Power Co. or that of the Airdrie and Coatbridge Electric Supply Co. is the more favourable.

Continental.—JUGO-SLAVIA.—A large new generating station, using the water power of the Sava, has been put into operation in Slovenia, and another installation will shortly be started up at Moste. The whole country is gradually to be supplied with electrical energy produced by the numerous powerful waterfalls. The machinery for these installations is being supplied by Germany in payment of her reparation debts.—*Reuter* (Belgrade).

FRANCE.—According to the *Revue Générale d'Electricité* the output of the 48 principal power stations in France during October last amounted to 811,018,609 kWh, bringing the total for the first ten months of the past year to 7,738,858,223 kWh, as compared with 8,235,261,174 kWh in the corresponding period of 1930, a decrease of nearly 6 per cent.

GERMANY.—A return just to hand shows that the output of the 122 principal electricity supply undertakings in Germany during October last amounted to 1,237,200,000 kWh, making the total for the first ten months of the past year 11,808,600,000 kWh, as compared with 13,392,300,000 kWh in the corresponding period of 1930, a decline of over 11 per cent.

Coxhoe (Durham).—STREET LIGHTING IMPROVEMENTS.—The Parish Council is to improve the lighting of the village by the provision of more electric lamps.

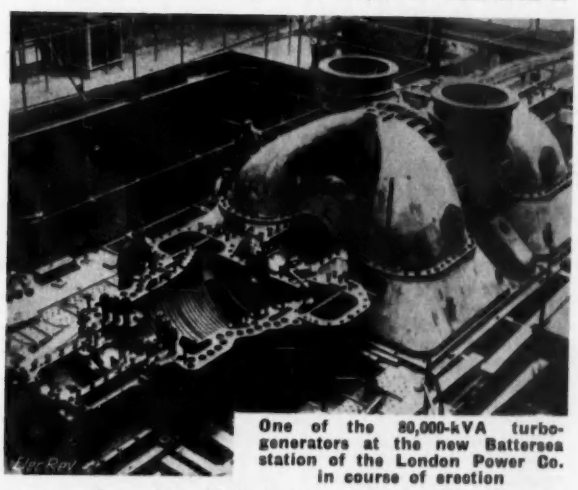
Darwen.—PROGRESS WITH GRID.—Towers are being erected on the eastern side of Darwen for the Central Electricity Board's grid scheme, which will link up Blackburn with Bolton. This is part of a line passing through East Lancashire to Keighley to join up with the Yorkshire circuits.

Dornoch (Sutherland).—A SUPPLY IN THE AUTUMN.—An agreement has been arrived at with the Grampian Electricity Supply Co. for a supply of electricity which, it is anticipated, will be available by the end of next autumn. A cable will cross the Dornoch Firth whence overhead lines will continue to the town.

East Ayton (Berwick).—STREET LIGHTING.—The supply for lighting the streets of the village was switched on last week.

Eastbourne.—ALL-IN TARIFF FOR RURAL AREA.—The Electricity Committee has adopted the following all-in tariff for the rural area: A fixed charge of 20 per cent. of the rateable value with a minimum charge of £4 per annum and a "unit" charge of 1d., this to apply only when cooking or water heating is installed either with or without heating.

East Ham.—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to loans of £20,200 for connection of



One of the 80,000-kVA turbo-generators at the new Battersea station of the London Power Co. in course of erection

consumers' premises; £4,000 for extension of distributor cables; and £5,384 for mains extensions, &c.

Eccles.—SEWAGE WORKS INSTALLATION.—The Sewage Committee is to obtain tenders for cables and electrical installation work at the sewage works.

FURTHER HIRE-PURCHASE FACILITIES.—The Electricity Committee has agreed to extend the hire-purchase period for electric cookers from three to five years. The cost of the wiring is to be included in the hire-purchase terms, and appliances at listed prices of between £1 and £3 are to be made available for purchase on the instalment system over a term of 1½ years. The assisted wiring scheme is to be restricted to dwelling houses having a rateable value not exceeding £20 and to houses in which one room is used for business purposes provided that the rateable value of such houses does not exceed £11 and that the supply is installed and used in all the occupied rooms.

Federated Malay States.—IMPROVED STREET LIGHTING.—The annual report of the F.M.S. Electrical Department states that considerable alterations, extensions and improvements have been carried out in the street lighting system. The switching of lamps in most of the a.c. areas is now done automatically by means of time switches, and towards the end of last year a system of central suspension of lamps over the roadways was commenced to give a better lighting distribution.

Formby (near Liverpool).—INCREASE IN CHARGES.—Increases in the price of electricity supplied through slot meters have been decided upon by the Urban District Council. A halfpenny per kWh extra will be charged for the ordinary flat rate lighting, and in cases where houses are wired under the Council's assisted wiring scheme, the increase will be 1d. per kWh.

Grimsby.—SUPPLY TO LACEBY.—Although the Unemployment Grants Committee has declined to provide assistance, the Town Council has decided to proceed with the scheme costing £7,858 for supplying electricity to Laceby.

Hamilton.—CHANGE-OVER.—The system of distribution is to be changed over in certain streets at a cost of £4,709.

Haslemere.—INCREASED CHARGES.—The Mid-Southern District Utility Co. has raised the charge for electricity supplied for other than domestic purposes from 1d. per kWh to 2½d. per kWh for the first 250 kWh per quarter, 2½d. for the next 500 kWh, 2d. for the next 500 kWh, and 1½d. for all additional energy.

India.—HYDRO-ELECTRIC DEVELOPMENT.—According to a Stockholm report, Mr. B. Hellstrom, the London representative of the Swedish Hydraulic Engineering Bureau, has returned from a visit paid to India for the purpose of investigating a proposal to electrify the State of Cochin by the use of the large waterfall, the Peringalkuthu, where the river Chalakudi has a fall of 160 metres. It is calculated that it would be possible to obtain 20,000 h.p. at an expenditure of about 10,000,000 kr. A report on the question is now to be prepared through Messrs. Rendell, Palmer and Tritton, London, with whom the Bureau co-operates. The amount of the expenditure on the works would be provided by the State of Cochin.

THE KOLAB SCHEME.—*Indian Engineering* states that Major H. G. Howard, chief hydro-electric engineer, Madras, has reported on the Kolab hydro-electric scheme in the Jaipur Zemindari in the Madras Presidency. It is estimated that the scheme will cost more than the Pykara scheme, and it is unlikely that there will be much of a demand for electricity.

Japan.—NEW POWER STATION.—The Yahagi Hydro-Electric Power Co. has received permission to erect the proposed Taifu power station on the Tenryu River. The station will have a capacity of 52,000 kW instead of 25,000 kW as originally planned.

Keswick (Cumberland).—OBJECTION TO TOWERS.—The Urban District Council has decided to ask for an inquiry into the question of erecting transmission line towers in the area by the Central Electricity Board. Mr. A. O. Sherrard, deputy secretary of the Board, attended a meeting of the Council and stated that the Board had to supply electricity as cheaply and as widely as possible. The cost of laying the cables underground would be about £11,000 a mile, whereas the cost of overhead cables was £1,300 a mile, and, furthermore, underground cables were not as satisfactory as overhead lines.

Liverpool.—EXTENSIONS.—The Electric Power and Lighting Committee has approved the extension of h.p. and l.p. overhead and underground mains, and the provision of pole transformers to provide a supply of electricity to Sefton, at an estimated cost of £2,156.

SPECIAL ORDER.—The Corporation has made application to the Electricity Commissioners to amend the draft of the Liverpool Electricity (Extension) Special Order so as to include in the electricity supply area the portion of the parish of Aughton which, by the Lathom and Burscough and Ormskirk Amalgamation Order, 1931, was added to the urban district of Ormskirk.

London.—FULHAM.—The Borough Council has received sanction to the borrowing of £10,000 for the extension of mains. Mains extensions are to be carried out in Ismailia Road and Lintaine Grove at an estimated cost of £330.

KENSINGTON.—On account of the present economic situation the Borough Council has decided to slow down the changing over of street lamps from gas to electricity.

BERMONDSEY.—The Electricity Committee has obtained sanction to loans of £15,000 for installations, £5,000 for meters and £10,000 for mains and services.

Loughborough.—PROGRESS DURING HALF YEAR.—In a recent report on the operation of the electricity undertaking, Alderman F. A. Stenson, chairman of the Electricity Committee, stated that a loss of £301 was recorded for the past half year, but that as the slot meters had been emptied late there was actually a profit of £146. There was a decrease of 337,734 kWh in the sales to power consumers, representing approximately £3,350, but the revenue at £23,141 was £2,858 higher than in the corresponding period of 1930. Considerable reductions in electricity charges are to be proposed by the Electricity Committee at its February meeting.

Maidstone.—OVERHEAD LINE INQUIRY.—Mr. A. Erskine, a Ministry of Transport inspector, recently held an inquiry into the Corporation's application to erect overhead lines on a portion of the proposed extension to Detling. The application was supported by the owner of a building estate in the village, and was opposed by a clergyman. For the Corporation it was pointed out that underground cables would render the cost of the scheme prohibitive.

Manchester.—CHANGING OVER TO ELECTRICITY.—The Housing Committee has decided to substitute electricity for gas in the Barrack Street dwellings.

Nawton (Yorks).—STREET LIGHTING.—At a meeting of ratepayers held recently it was decided to have electric street lighting installed in the village. Nawton will then be the first village in Ryedale to be lighted electrically.

Newcastle-on-Tyne.—DUNSTON STATION NEARING COMPLETION.—The new power station at Dunston which is being built for the Newcastle-upon-Tyne Electric Supply Co., Ltd., is nearing completion. The company is introducing electricity into rural areas within its territory in Northumberland, Durham, and North Yorkshire, and it is estimated that 300 farms have been already supplied.

Newport (Mon.).—STREET LIGHTING IMPROVEMENTS.—Following a request by the Chamber of Trade for improved street lighting, the borough electrical engineer has been asked to experiment with an improved type of street lamp and report generally with regard to lighting improvements.

Northern Ireland.—BELFAST.—The city electrical engineer has been given authority to invite tenders for additional switchgear required in the harbour power station in connection with the main transmission lines of the Electricity Board of Northern Ireland.

Nottingham.—ASSISTED WIRING SCHEME.—The Electricity Committee has decided to give electrical contractors the opportunity of tendering for a portion of the work to be carried out under the assisted wiring scheme.

Oswestry.—ASSISTED WIRING SCHEME.—The Town Council has adopted an assisted wiring scheme to apply to private houses to the extent of not more than nine lights or fewer than three. The views of the electrical contractors in the district are to be ascertained regarding a scheme to fix uniform prices, on the basis of an approved specification, for installation work.

Oxford.—CHANGE-OVER.—The Electricity Committee has authorised the deputy electrical engineer to obtain options for the supply of the lamps, cables, &c., required in connection with the change-over and to submit the names of contractors willing to undertake the work of rewiring.

Philippine Islands.—HYDRO-ELECTRIC DEVELOPMENTS.—A proposal to develop the water-power resources of the Philippines on a large scale has been put forward in the form of a Senate measure sponsored by one of the two engineers who are members of the Philippines Senate. The purpose of the Bill is the creation of a semi-public corporation to be known as the National Electric Power and Development Co., with a capital of 35,000,000 pesos. According to the Bill the proposed hydro-electric plants would derive their power "principally from the Agno River or from other rivers, waterfalls, or from other bodies of water within the Philippine Islands which may be utilised for the said purpose."

Sedgefield (Durham).—IMPROVED LIGHTING FOR CHILTON?—The Rural District Council is to write to Messrs. Dorman Long & Co., Ltd., asking them to improve the electric lighting in the village of Chilton, for which they are responsible.

Sherburn (Durham).—PUBLIC LIGHTING.—The Parish Council has decided to install electric lamps on the road from West Sherburn to Sherburn House station.

Silksworth (Durham).—CANVASS OF VILLAGE.—The Parish Council has decided to take a canvass of the inhabitants of the village in order to ascertain the demand for electric lighting. It is estimated that the cost of wiring will be £6 a house.

South Wales.—IMPORTANT POWER AGREEMENT.—An agreement has been reached whereby the South Wales Electrical Power Distribution Co. will supply the whole of the power requirements of the British (Guest-Keen-Baldwins) Iron & Steel Co., Ltd., and the Welsh Associated Collieries, Ltd., and will take over the large Dowlais power station owned by the last-mentioned company.

Stockton-on-Tees.—HIRE-PURCHASE SCHEME.—The Electricity Committee has decided to introduce a scheme for the hire-purchase of electrical apparatus.

Stretford.—STREET LIGHTING IN FOGGY WEATHER.—In connection with lighting during foggy weather the Highways Committee, in conjunction with the Central Electricity Board, hopes shortly to make experiments with light-sensitive equipment for automatically controlling the main road lights.

LIGHTING OF PUBLIC HALL.—The Urban District Council is to obtain estimates for the provision of a modern scheme of lighting for the public hall.

SPECIAL ORDER.—The Stretford and District Electricity Board has applied to the Electricity Commissioners for a Special Order authorising the transfer to it of the electricity undertaking of the Irlam Urban District Council.

Swindon.—POWER STATION EXTENSIONS.—The switchgear bay at the Moredon power station is to be extended at a cost of £1,695.

Torquay.—PURCHASE OF THURLESTONE UNDERTAKING.—The Electricity Committee has decided to purchase the Thurlestone electricity undertaking for £2,750.

United States.—HYDRO-ELECTRIC DEVELOPMENT AT CORINTH.—*Power* states that plans are in the preliminary stages for a $3,000,000 hydro-electric development by the International Paper Co. at Corinth, N.Y., involving the construction of a large dam creating a six-mile lake in the Hudson River.

PRODUCTION OF ELECTRICITY IN 1931.—The total production of electricity for public use in the United States in 1931, as estimated from the production from January to November, was about 91,650,000,000 kWh, or about 4½ per cent. less than in 1929. The average annual increase in production of electricity for public use from 1919 to 1929 was about 10 per cent. Electrical energy produced by water power in 1931 is estimated at about 30,000,000,000 kWh, about one-third of the total production for the year.

Walthamstow.—PRICE REDUCTIONS.—The Electricity Committee proposes to reduce the charges for electricity for ordinary lighting from 4½d. to 4d. per kWh, and for outside shop-window lighting from 2½d. to 2d.

Weymouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,600.

Yarmouth.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £32,500 for mains and services, wiring installations and meters.

Traction

Burnley.—RELAYING OF TRACK.—The Tramways Committee is to relay tramway track at a cost of £1,950.

Continental.—AUSTRIA.—The managers of the Austrian Federal Railways, of which 623 km. has already been converted to electric traction, are making preparations for continuing the work of electrification. Negotiations are proceeding as to conditions under which a supply of power can be obtained for the further lines to be taken in hand. These are between Salzburg and Vienna and between Vienna and Gratz, a total length of 525 km.

East Suffolk.—TRAFFIC SIGNALS.—The County Council is to install automatic traffic signals in various districts.

Eccles.—AUTOMATIC TRAFFIC CONTROL.—The Corporation is to install automatic traffic control signals.

Japan.—NEW ELECTRIC RAILWAYS.—The following electric railways have recently been chartered:—Doyoko Electric Railway from Abuta-mura, Abuta-gori, Iburi Province, Hokkaido to Higashi-Kuchiyasu-mura (42 km); Nunobiki Electric Railway from Kita-Mimaki-mura to Honmoku-mura, Nagano-ken (8 km), at a cost of 300,000 yen; and the Keihan Electric Railway from Chisato-mura, Mishima-gori, Osaku-fu, to Yamada-mura (2 km), at a cost of 600,000 yen.

Leeds.—MORE TRAFFIC SIGNALS.—The Watch Committee has decided to install additional automatic traffic signals wherever necessary and feasible.

Liverpool.—NEW BOGIE TRAMWAY TRUCK.—With reference to the new bogie electric tramway truck, which has just been adopted at Liverpool, the Corporation tramway manager has been instructed to report as to the running of this vehicle and to give details of operating costs and expenses. He is also to prepare a specification for the new bogie truck car and to invite tenders therefor.

London.—EXTENSION OF TRAFFIC SIGNALS.—The extension of the Oxford Street system of automatic traffic control along New Oxford Street and High Holborn as far as Gray's Inn Road is proposed by the Holborn Borough Council.

Newcastle-on-Tyne.—PROPOSED TRAMWAY ABANDONMENT.—The Tramways Sub-Committee has under consideration a proposal to replace tramcars by omnibuses on the Spital Tongues route.

RELAYING OF TRAMWAY TRACK.—It is expected that an inquiry will be held into the City Council's application for sanction to a loan for the relaying of the tramway track on the Osborne Road route.

Southern Railway.—LONDON-BRIGHTON ELECTRIFICATION SCHEME.—It is expected that the first section of the Southern Railway Co.'s scheme for electrifying the main line between London and Brighton will be completed in April, when a three months' test will be carried out before the inauguration of the public service in July.

United States.—RAILWAY ELECTRIFICATION.—According to the *Railway Gazette*, rapid progress is being made with the extensive electrification schemes of the Pennsylvania Railroad, which will provide through electric traction over the 225 miles between New York, Philadelphia, Baltimore, and Washington. The electrification is part of an improvement scheme costing a total of $175,000,000, initiated by General Atterbury, President of the Pennsylvania Railroad, and now to be completed in two and a half years instead of the four years originally planned.

Communications

Cornwall.—RADIO DIRECTION FINDER.—The Board of Trade announced this week that the Lizard direction-finding wireless station would be closed at midnight on March 31, as an economy measure. The station has been maintained solely for the purpose of giving wireless bearings to ships, while the use made of the station is only sufficient to provide a revenue which is less than one-fourth of the running cost.

Germany.—TELEVISION CONFERENCE.—A meeting of representatives of undertakings interested in the development of television was held in the Ministry of Posts in Berlin on January 18, under the chairmanship of Herr Kruckow, head of the Wireless Department, says *The Times*.

The interests represented were the Telefunken Gesellschaft, the Thun, Loewe and Ardenne patents, and the Fernseh A.G., which is associated with the Baird Television Company in England. Mr. Baird, who was in Berlin, did not attend the meeting.

For several years the Reich Ministry of Posts has provided experimental long-wave transmitters working on 1,200 or 3,000 points and using the Baird sytem. It was decided at the meeting to erect at the Witzleben broadcasting station in Berlin an experimental seven-metre television transmitter on the Baird system with 10,800 points. This transmitter has been ordered by the Ministry from the Fernseh A.G. There is no intention at present of instituting regular public television broadcasts, but it is the aim of the Ministry, which has the monopoly of all electric transmission processes, to provide means for encouraging the development of suitable receiving sets.

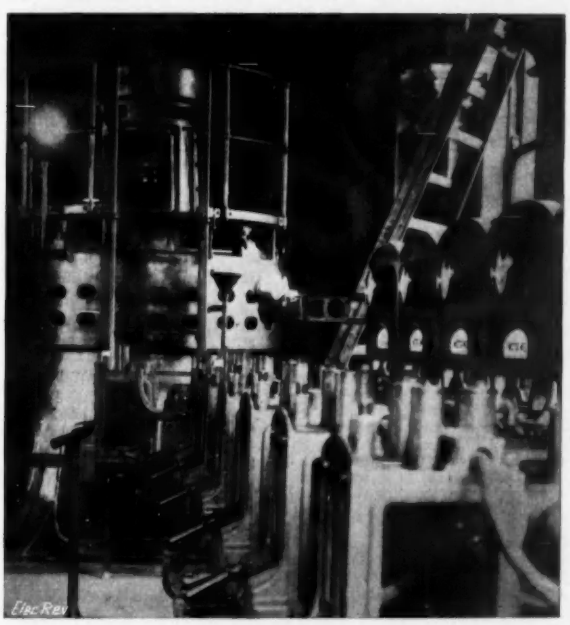
Great Britain.—WIRELESS LICENCES.—It is announced by the Post Office that on December 31st there were 4,329,754 radio receiving licences in force, representing an increase of 909,304 during the past year. The previous largest increase (544,623) occurred in 1929.

Irak.—NEW TELEPHONE LINK.—The first commercial telephone call from Baghdad to Basrah took place on January 12th, when two newspaper editors conversed with one another.—*Reuter.*

Irish Free State.—RADIO EXCHANGE.—The Limerick Corporation has received an application from Central Radio Exchanges, Ltd., of London, for permission to establish a broadcast radio relay service. The Corporation is to ascertain the views of the Irish Minister of Posts and Telegraphs on the subject.

London.—COMMUNICATION INTERFERENCE.—A meeting of the Consultative Committee of the International Commission on Long-distance Telegraphy and Telephony was held in London on January 12th and 13th, when experts and engineers from the various countries concerned examined and agreed upon methods and formulæ for locating and remedying interference phenomena associated with power and communication circuits.

Great Britain's share in this important research has been the subject of careful study and experiment during the past year by a committee of the British Electrical and Allied Industries Research Association, which, in co-operation with technicians of the G.P.O., was able to record valuable results from investigations conducted at Shap and Eltham in connection with inductive interference by earth currents from overhead power lines and buried cables. The meeting was attended by representatives of the principal British and foreign power and railway interests, while the growing enthusiasm for co-operative research was evidenced by the facilities afforded by the Central Electricity Board, its consulting engineers and contractors, the Woolwich Corporation electricity undertaking, the German Post Office, and the Imperial Geophysical Survey.



[News Photos

The Abbey Mills pumping station of the L.C.C. is being equipped with electric pumps to replace those of the beam type installed about 60 years ago. We illustrate one of the new centrifugal pumps (capacity 125 tons a minute) with some of the switchgear

Stafford.—RADIO RELAY SERVICE.—The Town Council has entered into an agreement with Rediffusion, Ltd., of London, for the establishment of a broadcast relay service. The company is to pay the Corporation a royalty of 5 per cent. of all subscriptions received by it.

United States.—RADIO RECEIVERS.—In 1930 radio sets were owned by 12,078,345 families, or 40.3 per cent. of the country's total of 29,980,146 families, according to tabulations of the Bureau of Census, U.S. Department of Commerce. New Jersey leads in "density" of set ownership with 63 per cent. New York state is second with 57.8 per cent., Massachusetts third with 57.6 per cent., and Mississippi last with only 5.4 per cent. of its families using receivers. Such detailed information assists manufacturers and distributors to plan sales intelligently.

TELEPHONY IN 1931.—While there was a small decrease in the number of telephones used in the United States during 1931, the industry did not experience the loss common to general business that year. The gross expenditure of the Bell System on new plant, including replacements, is estimated at $390,000,000, a decrease on the previous three years' figures. Some 6,300,000 dial telephones and 3,000,000 hand sets were in use. Switched teletypewriter service was introduced in November, 1931. About 800,000 ft. of buried cable replaced overhead lines, and 70 per cent. of the toll circuits were underground.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Army Contracts.—Manufacturers who are not on the War Office list of tenderers and who wish to be invited to tender for general stores should apply to the Director of Army Contracts, Caxton House, Tothill Street, S.W.1. (January 8th.)

Australia.—BARRON FALLS HYDRO-ELECTRIC BOARD.—March 28th. Two 2,000-h.p. water turbines with alternators and switchgear, &c. Plans and specifications (deposit £2 2s.) from Mr. A. E. Wilkinson, clerk to the Board, Council Chambers, Cairns.

Belgium.—BRUSSELS.—January 27th. Régie des Télégraphes et Téléphones, Salle de la Madeleine, Brussels. Supply and laying of telephone cables at Eupen, Thimister, and Namur. Particulars (Cahier des Charges Special No. 3—590) for 5.50 fr.

Blackburn.—February 29th. Electricity Department. Insulated cable and wire and meters. (See this issue.)

Blackpool.—January 25th. Town Council. Stores, including electrical materials, for year 1932-3. Specifications from the borough treasurer, Town Hall.

Bradford.—January 26th. Corporation. Installation of electric lighting at the Westwood Estate, Clayton Heights. Particulars from the city architect, Town Hall.

Cheadle and Gatley.—February 9th. Electricity Department. General stores. (January 8th.)

Darlington.—TOWN COUNCIL.—Installation of electric lighting at the public baths in Kendrew Street and at the public library extensions in Crown Street. Plans, &c., from Mr. J. P. Wakeford, borough engineer, Town Hall.

Dewsbury.—January 25th. Town Council. Electric wiring at Wheelwright Girls' Grammar School. Specification and form of tender from Mr. R. W. Grubb, Electricity Dept., Bradford Road, Dewsbury.

Egypt.—CAIRO.—February 17th. Government Workshops. Diesel pumping set. (G.X. 11092.)*

February 18th. Ministry of the Interior. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)* Water works with electric pumping equipment for Samallout. (G.X. 10962.)*

Erith.—January 27th. Electricity Department. Transformers. (January 8th.)

Farnworth.—February 5th. Electricity Department. L.p. cables. (See this issue.)

Hastings.—February 9th. Electricity Department. General stores. (See this issue.)

Lanark.—COUNTY COUNCIL.—Various works, including electric lighting, at 110 houses. Particulars from Mr. P. C. Smith, County Housing and Town Planning Department, Hamilton.

Lithuania.—KAUNAS (KOVNO).—February 3rd. Administration of Posts and Telegraphs. 450 table telephones, 50 wall telephones, &c. (A.X. 11227.)*

London.—CENTRAL ELECTRICITY BOARD.—January 25th. Construction of site works, foundation works, &c. (*a*) at Portishead and Upper Boat for the South-West England and South Wales Electricity Scheme, and (*b*) at Carlisle, Padiham and Kearsley for the North-West England and North Wales Electricity Scheme. (December 18th.)

February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (December 18th.)

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—February 18th. Auxiliary switchgear and accessories for the Barking power station extensions. (January 8th.)

ISLINGTON.—February 19th. Borough Council. Street lamp columns with bases and fittings. (See this issue.)

Manchester.—January 30th. Electricity Department. Supervisory control gear and sheet-steel neutral earthing cubicles, &c., for power transformers at the Queen's Park sub-station. (January 8th.)

January 27th. Electric cookers. (January 15th.)

New Zealand.—WELLINGTON.—March 1st. Post and Telegraphs Department. 250 gongs. (A. 11230.)*

May 3rd. Public Works Department. 110- and 33-kV outdoor switchgear and steelwork for Waitaki power scheme. (A.X. 11233.)*

February 23rd. Four 1,000-kVA single-phase transformers, with automatic voltage regulating equipment. (A.X. 11213.)*

Northern Ireland.—BELFAST.—January 25th. Tramways Department. General stores. (January 8th.)

January 22nd. Electricity Department. General stores. (January 1st.)

Oswestry.—January 22nd. Electricity Department. E.h.p. and l.p. overhead lines. (January 15th.)

Plymouth.—February 15th. Corporation. Meters, time switches, underground cables, transformers and e.h.p. and l.p. switchgear. (See this issue.)

Portsmouth.—February 2nd. Tramways Committee. General stores. (See this issue.)

South Africa.—JOHANNESBURG.—February 13th. City Council. Automatic traffic signals. (A.X. 11235.)*

Southend-on-Sea.—February 3rd. Electricity Department. General stores. (January 1st.)

West Midlands.—Joint Electricity Authority. February 10th. 11,000-V overhead lines on wood poles. (See this issue.)

Wolverhampton.—February 15th. Electricity Department. E.h.p. metal-clad switchgear. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Electricity Committee. Recommended. Wiring under the assisted scheme.—C. Hutton; C. Hoad.

Bury St. Edmund's.—Town Council. Accepted. Switchgear (£300).—Ferguson, Pailin, Ltd. Transformer (£647).—Johnson and Phillips, Ltd. Distributor control gear (£107).—English Electric Co. Cable (£1,197).—Callender's Cable & Construction Co., Ltd.

Clydebank.—Fire and Lighting Committee. Accepted. Lighting of Mount Blow Road, Dalmuir (£111).—General Electric Co., Ltd.

Gainsborough.—Urban District Council. Accepted. Transformer complete with switchgear.—Brush Electrical Engineering Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government departments during December:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Condenser installation.—Telegraph Condenser Co., Ltd.
Electric light fittings.—Edison Swan Electric Co.; Engineering & Lighting Equipment Co.; Gabriel & Co.; G.E.C.; W. McGeoch & Co.; Oliver Pell Control; Player, Mitchell & Breeden; Rainsford & Lynes; Revo Electric Co.; Veritys.
Electric generating sets.—Crossley Bros.
Electric lamps.—G.E.C.; Siemens Electric Lamps & Supplies; B.T.-H. Co.
W/t masts.—Milliken Bros.
Racks, accessories for w/t receivers.—McGeoch & Co.
Switches.—Alfred Graham & Co.
Switchgear.—Whipp & Bourne.
Electric truck and spare battery.—R. A. Lister & Co.
Tuner amplifiers.—Radio Instruments, Ltd.
Aerial wire.—F. Smith & Co.
Copper wire.—Concordia Electric Wire Co.; Connollys (Blackley); Enfield Cable Works; Johnson, Clapham & Morris; Kent Bros. Electric Wire Co. & E. H. Phillips; London Electric Wire Co. & Smiths; F. W. Potter & Soar.
X-ray machines, apparatus and radiographic couch.—A. E. Dean.

WAR OFFICE.

Motor directing switches.—I. R. G. P. & Telegraph Works Co.

AIR MINISTRY.

D.c. electric motor.—Bull Motors, Ltd.

CROWN AGENTS FOR THE COLONIES.

Cable.—B. I. Cables, Ltd.
X-ray apparatus.—Newton & Wright, Ltd.

POST OFFICE.

Telegraphic apparatus.—Creed & Co.
Telephonic apparatus.—Automatic Telephone Mfg. Co.; Ericsson Telephones; G.E.C.; Siemens Bros.; Standard Telephones & Cables; Telephone Mfg. Co. (1929).
Terminal blocks.—Thomas De La Rue & Co.; Ebonestos Insulators.
Service boxes.—Venner Time Switches.
Cable.—B. I. Cables; Connollys (Blackley); Enfield Cable Works; Henley's; Pirelli-General Cable Works; Siemens Bros.; Standard Telephones & Cables; Telegraph Construction & Maintenance Co.; Union Cable Co.
Cable drums.—Pirelli-General Cable Works.
Condensers.—Standard Telephones & Cables.
Conduit and conduit fittings.—F. C. Blackwell & Co.; Falk, Stadelmann & Co.; Steel Tube & Conduits Co.; O. C. Summers.
Electric passenger lift, G.P.O. (West), E.C.—Pickerings, Ltd.
Telephone cords.—Phœnix Telephone & Electric Works; Standard Telephones & Cables.
Telephonic repeater equipment, Leicester, Taplow.—G.E.C.
Transformers, &c.—Birmingham head post office sub-station.—Crompton Parkinson.
Telephone exchange equipment.—Selfridge & Co., Priory (Birmingham area).—Ericsson Telephones. Sub-contractors for Priory: Hart Accumulator Co. for batteries; Electric Construction Co. for charging machine. Sloane, Fulham, Terminus (London area).—Standard Telephones & Cables. Sub-contractors for Terminus: Hart Accumulator Co. for batteries; Electric Construction Co. for charging and ringing machines. London trunk exchange.—Standard Telephones & Cables. Sub-contractors: D. P. Battery Co. for batteries; Electric Construction Co. for charging and ringing machines. Bishopsgate, Paignton, Torquay.—Automatic Telephone Mfg. Co. Edgware, Birmingham, Haverton Hill (Middlesbrough area), Kensington.—G.E.C. Sub-contractors for Kensington: D. P. Battery Co. for batteries. Belgrave (Leicester area), Warstock and Halesowen (Birmingham area).—Siemens Bros. Sub-contractors for Halesowen: Hart Accumulator Co. for batteries; English Electric Co. for charging machine. Middleton and Failsworth (Manchester).—Siemens Bros. Sub-contractors: Chloride Electrical Storage Co. for batteries; English Electric Co. for charging machines; Crompton Parkinson for ringing machines. Aston Cross (Birmingham area).—Siemens Bros. Sub-contractors: Chloride Electrical Storage Co. for batteries; Electric Construction Co. for charging machine; Crompton Parkinson for ringing machine. Shirley (Birmingham area).—Siemens Bros. Sub-contractors: Hart Accumulator Co. for batteries; Electric Construction Co. for charging machine.

H.M. OFFICE OF WORKS.

Wiring, &c., Kew Gardens Herbarium.—Electrical Installations, Ltd.
Motor for Teddington Laboratory.—English Electric Co.

Gravesend.—Electricity Committee. Recommended. Transformer for supply to Northfleet Paper Mills (£294).—British Electric Transformer Co., Ltd.

Liverpool.—Electric Power and Lighting Committee. Accepted. Automatic telephone installation in the offices of the Lighting Department, Highfield Street (£110).—Automatic Telephone Manufacturing Co., Ltd.

London.—HACKNEY.—Works Committee. Recommended. Electric vehicle (£690).—Electricars, Ltd.

ISLINGTON.—Cleansing Committee. Recommended. Electric vehicle battery (£130 net).—Fuller Accumulator Co. (1926), Ltd.

Manchester.—Education Committee. Accepted. Electrical installation at Collyhurst School.—R. Seddon & Sons. Electrical installations at the New Moston School extensions.—R. Seddon & Sons; S. H. Heywood & Co., Ltd. Electric lifting block.—Wharton Crane & Hoist Co., Ltd.

Public Health Committee. Accepted. Electric food lifts.—Evans Lifts, Ltd. Electric truck.—Herbert Morris, Ltd. Electric food mixer.—Baxendale & Co., Ltd. Electric bed lift.—Etchells, Congdon, and Muir.

Transport Committee. Accepted. Two electrically operated motor bus hoists at the Princess Road and Parr's Wood Garages.—Equipment & Engineering Co., Ltd.

Housing Committee. Accepted. Installation of electric lighting at houses in Stokes Street, Clayton.—R. H. Clampett & Co., Ltd.

Newcastle-on-Tyne.—City Council. Accepted. Installation of electric lighting at the Sandyford Road Council School (£178) and the North Heaton Council Schools (£405).—Simm and Richardson, Ltd.

Portsmouth.—Public Assistance Committee. Accepted. Electric wiring at hospital (£82).—G. E. Taylor & Co.

Electricity Committee. Accepted. Cables.—Derby Cables, Ltd. (£5,960); Hackbridge Cable Co., Ltd. (£410); Mersey Cable Works, Ltd. (£99); Metropolitan Electric Cables, Ltd. (£410). Service boxes.—J. Shervell, Ltd.

Worcestershire.—County Council. Recommended. Electric lighting installation at the Kidderminster Institution (£1,465).—Abell & Smith.

West Riding.—County Council. Accepted. Electric light fittings for Registry of Deeds buildings at Wakefield (£236).—Holophane, Ltd. Internal telephones (£122).—Automatic Telephone Mfg. Co., Ltd.

Weymouth.—Electricity Committee. Recommended. Buildings and electrical work for new showrooms at Royal Terrace (£830).—V. H. Bennett & Co.

Yarmouth.—Electricity Committee. Accepted. Coaling apparatus for new boiler (£1,183).—Mitchell Conveyor Co., Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, January 22nd. Grand Hotel, Birmingham. 7 p.m. Presidential address.

Electrical Power Engineers' Association (*Manchester Section*).—Saturday, January 23rd. Grand Hotel, Manchester. 6.30 p.m. Social evening and dance.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, January 23rd. Grand Hotel, Cardiff. 7.15 p.m. Supper and smoking concert.

Institution of Electrical Engineers.—Monday, January 25th. Institution, London. 7 p.m. Informal meeting. Discussion on "Engineering Conditions in Russia." Mr. J. C. Wigham. (*North-Eastern Centre.*)—Friday, January 22nd. Grand Assembly Rooms, Newcastle-on-Tyne. 7 for 7.30 p.m. Annual dinner and dance. Monday, January 25th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Methods and Equipment in Cable Telegraphy." Messrs. H. Kingsbury and R. A. Goodman. (*North Midland Students' Section.*)—Saturday, January 23rd. 2 p.m. Visit to B.B.C. Station, Moorside, near Huddersfield. (*Scottish Centre.*)—Tuesday, January 26th. North British Station Hotel, Edinburgh. 7 p.m. "Coil Ignition Systems." Mr. E. A. Watson. (*North Midland Centre.*)—Tuesday, January 26th. Hotel Metropole, Leeds. 7 p.m. "The Electrical High-pressure Testing of Cables and the Localisation of Faults." Mr. J. Urmston. (*North-Western Centre.*)—Tuesday, January 26th. Engineers' Club, Manchester. 7 p.m. "Modern Boiler Plant." Mr. J. Bruce. (*London Students' Section.*)—Tuesday, January 26th. Institution, London. 6.15 p.m. Joint meeting with students and graduates of the Institutions of Civil and Mechanical Engineers. "A Record of the Development of Thermal Storage Apparatus." Mr. K. R. Sturley. Friday, January 29th. Institution, London. 6.15 p.m. "The Starting of Three-phase Induction Motors." Mr. J. F. Veevers. "The Automatic Control of a Large Bookbinding Machine." Mr. E. H. K. Palmer. Saturday, January 30th. 2.30 p.m. Visit to Grove Road power station, St. John's Wood, N.W. (*Sheffield Sub-Centre.*)—Friday, January 29th. Royal Victoria Hotel, Sheffield. 7.15 for 7.30 p.m. Annual supper-dance.

Electrical Association for Women.—Tuesday, January 26th. 3 p.m. Visit to new showrooms of the Brompton and Kensington Electricity Supply Co., Ltd.

Diesel Engine Users' Association.—Wednesday, January 27th. Caxton Hall, Westminster, S.W. 3.30 p.m. Consideration of the Report of the Committee on Heavy-oil Engine Working Costs (1930-31).

Rugby Engineering Society.—Wednesday, January 27th. Benn Buildings, Rugby. 7.30 p.m. "Cable-Making." Mr. W. Lang.

Electrical Contractors' Association.—Wednesday, January 27th. Savoy Hotel, W.C. 6.30 for 7 p.m. Annual dinner.

Institution of Mechanical Engineers.—Friday, January 29th. Institution, Storey's Gate, S.W. 6 p.m. "The Mechanism of Electric Locomotives." Mr. J. D. Twinberrow.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the maker of the following:—

B.G. alabaster hall lantern.

Notes

The London J.E.A. Inquiry

At the resumption of the inquiry into the proposed extension of powers of the London and Home Counties Joint Electricity Authority (the opening of which was reported on p. 102 of our last week's issue), Major H. Richardson (Metropolitan Electric Supply Co., Ltd.) suggested that in reducing flat-rate prices recently the J.E.A. had gone against the recommendations of the Tariff Advisory Committee of the Electricity Commissioners. He denied that he was opposed to co-ordination, but he was anxious that there should be no encroachment upon areas that had been equally well developed. His apprehensions were more on account of the possible methods employed in carrying out the powers than with regard to the powers themselves.

Mr. Evan Charteris, K.C., for the London Electric Power Co., Ltd., submitted that the J.E.A. had been created to reorganise the development of electricity and not to come into conflict with the companies. The Order for the extension of the powers of the J.E.A. diminished the possibility of successful competition. The substitution of the Authority as owner of an undertaking that was partly in the area of a company would prejudice the position of the company.

Sir Lynden Macassey said that there was no evidence whatever that the J.E.A. aimed at the acquisition of all undertakings. He denied the suggestion that the J.E.A. had been in any way responsible for the Press agitation regarding prices charged by the undertakings.

The decision of the Electricity Commissioners will be announced at a later date.

The Melchett Medal

In our last issue the date for the presentation of the Melchett medal to Prof. W. A. Bone was incorrectly given as February 18th. The presentation is to be made on February 1st.

22-kV Operation Experience

About 1,000 mile-years of operating experience with 22-kV transmission has been obtained by the Hydro-Electric Power Commission of Ontario. According to the *Electrical World*, 16 line interruptions have occurred, or on an average 1.6 per 100 miles per annum; ten of these were due to lightning. Where the two circuits were in operation only one interruption (due to switch failure) affected the supply, which was maintained through the other circuit. Line flashovers have been cleared without permanent damage to the conductor, with one exception, and in most cases without the shattering of insulators.

One conductor only was involved in six lightning flashovers, two conductors in three, and all three conductors in one case only. There was no case of simultaneous flashover on two circuits which are spaced 100 to 150 ft. apart. Flashovers involving two phases and earth have not caused any tendency to instability. The majority of the lightning flashovers occurred in a district where tower-footing resistances are about 250 ohms. These resistances are to be reduced by buried conductors.

The World's Generating Capacity

The installed capacity of public electricity supply undertakings throughout the world is estimated in the *Electrical World* at 98,792,648 kW, including 35,086,188 kW in the United States. Of the European countries, Germany leads with 12,416,000 kW. France is next with 12,976,071 kW, and then come Great Britain (9,323,000 kW) and Italy (9,166,723 kW). In the United States 1,403,000 kW of generating plant was installed in 1931.

Generation of Electricity in December, 1931

The official returns rendered to the Electricity Commissioners show that 1,223 million kWh of electricity was generated by authorised undertakers in Great Britain during the month of December, 1931, as compared with the finally revised figure of 1,150 million kWh in the corresponding month of 1930, or an increase of 6.3 per cent.

During the year ended December 31st, 1931, the total amount of electricity generated by authorised undertakers was 11,401 million kWh, as compared with the finally revised figure of 10,914 million kWh for the year ended December 31st, 1930, representing an increase of nearly 4.5 per cent.

I.E.E. Graduateship Examination

The list of successful candidates who sat for the graduateship examination of the Institution of Electrical Engineers in November, 1931, shows that 43 passed the whole examination, seven passed Part I only, and 15 passed Part II only. Results relating to candidates who sat for the examination abroad are not yet available.

Appointments Vacant

Electrical engineer and manager for Cleethorpes Electricity Department.

Meter tester and repairer for Southampton Electricity Department.

Transport manager for Walsall Corporation.

Clerks for Walsall and Rochdale Corporations.

(See our advertisement pages to-day)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. Thos. E. Roles, city electrical engineer of Bradford, completes 25 years in that post at the end of January, during which period the number of consumers of his department has increased from 2,250 to 33,885, and the annual income from £107,037 to £619,198. Mr. Roles went to Bradford in 1904 as chief assistant to Mr. Alfred Blackman, and became city electrical engineer near the end of 1906, when Mr. Blackman went to Sunderland. Mr. Roles has been president of the Incorporated Municipal Electrical Association, chairman of the North Midland Centre of the Institution of Electrical Engineers, chairman of the Yorkshire Electricity Supply Linking-Up Committee, and chairman of the West Riding Engineers' Advisory Committee to the grid scheme.

At last week's meeting of the Plymouth City Council it was proposed that the salary of **Mr. Illingworth,** the deputy electrical engineer, should be raised to the National Joint Board's schedule rate—£651. His present salary is £523. The proposal was rejected by 36 votes to 14.

Mr. David James is retiring from the managing directorship of the Swansea Improvements and Tramways Co., and the South Wales Transport Co., Ltd., as from March 1st next. He will, however, remain on the boards of the companies. He will be succeeded as general manager by **Mr. P. R. Blake,** general manager of the Scottish General Transport Co., Ltd.

Capt. H. G. Merrick has been appointed general manager of the Llanelly & District Electric Supply Co., Ltd., in succession to the late Mr. H. M. Taylor.

Major J. J. Murphy, D.S.O., has been appointed secretary to the Council of the British Electrical and Allied Industries Research Association.

Mr. R. W. Cramp is resigning from the position of manager of the Tynemouth and District Electric Traction Co., Ltd., and is to become a director of the company. He was formerly manager of the Birmingham and Midland Tramways Co. **Mr. John Petrie** is to become manager of the Tynemouth Traction Co.

Mr. E. A. Mellinger has resigned from the board of the Telephone and General Trust, Ltd., and **Mr. Rene Pleven,** of the General Telephone and Electric Corporation of the United States has been appointed to fill the vacancy.

Mr. W. E. Jones, acting borough electrical engineer, has been appointed by the Basingstoke Town Council to the position of borough electrical engineer. **Mr. G. H. Perkins,** temporary assistant engineer, has been appointed assistant electrical engineer.

Mr. O. G. Cook, chief engineer and manager to the Bingley electricity undertaking, is not now connected with the Barnoldswick U.D.C. electricity undertaking, having resigned his appointment with that Council in September last.

Mr. W. Vane Morland, whose appointment as general manager and chief engineer of the Leeds Corporation Tramways Department was announced in our last issue, was selected from 60 applicants for the post. Mr. Vane Morland, who is 47 years of age, has had twelve years' experience as general manager and engineer of tramways and transport undertakings, for the past six years at Walsall. His experience includes every phase of road passenger transportation, and at Walsall he has been responsible for omnibus services running through the areas of 16 local authorities and operating over 231 miles of route. The annual revenue of the undertaking has been increased under his management by nearly £100,000, and the number of passengers carried has risen in the last five years by nearly 9,000,000 to 23,873,000. He is a recognised authority on Diesel engines, and the author of a number of papers on the development of the heavy-oil engine for transport purposes. During the war he held a commission in the Army, and in 1917 was attached to the War Office for technical duties and was afterwards appointed president of the Technical Board of Officers. The Leeds undertaking is one of the biggest concerns of its kind in the Kingdom, with an annual turnover of over £1,000,000. It employs over 3,500 people, and last year carried nearly 200,000,000 passengers. Mr. Morland succeeds the late Mr. R. L. Horsfield, who was also a former manager of the Walsall Transport Department.

[Chidley, Walsall

Mr. W. Vane Morland, the new manager of the Leeds Corporation Tramways

According to the daily Press, **Sir Alexander and Lady Roger** have left for Jamaica and Venezuela, and they will return early in March.

The Marquis of Milford Haven has joined the board of Electrolux, Ltd.

Ill-health was responsible for the absence from the I.E.E. dinner at Manchester on Tuesday of three men who occupy prominent places in the industry. **Sir Hugo Hirst** has been ordered abroad by his doctor; **Sir John Brooke** has an attack of influenza; and **Mr. H. C. Lamb** is suffering from throat trouble. We wish them all a speedy return to fitness.

Mr. J. Snow Huddleston has been elected by the board of directors of the Union Cable Co., Ltd., to a seat on the board, and has been appointed managing director in appreciation of the valuable services which he has rendered to the company as general manager. Mr. Huddleston commenced his career with Siemens Bros., at their Woolwich works in 1889, and after passing through the various departments specialised in cable making. He left Siemens's in 1918 to take up the position of general manager of the Union Cable Co., Ltd., since when the company's activities have greatly increased. He has always taken a keen interest in the social side of the company, and established a sick and benevolent fund for the employés, to whom he has also given a sports ground and pavilion in Dagenham. He has played an active part in the Cable Makers' Association since its inception in 1899, and was chairman in 1925. He became a member of the Institution of Electrical Engineers in 1921.

[Elliott & Fry.

Mr. J. Snow Huddleston, who has been appointed managing director of the Union Cable Co.

The ELECTRICAL REVIEW tenders its good wishes to **Dr. F. J. Waldo** upon his retirement from the office of Coroner for the City of London, at the age of 80. Dr. Waldo has held that office for thirty years and he exercised the coroner's right of holding fire inquests. We hold it to be our duty, and at the same time feel it a pleasure, to place on record the appreciation that is due to Dr. Waldo for having again and again exercised his searching powers as a barrister in getting to the bottom of matters when electricity was suspected of being the cause of a fire. His communications to our pages will not be forgotten.

Mr. A. V. Cross, of Walsall, has been appointed chief clerk in the Bingley Council's Electricity Department, in succession to **Mr. A. Senior,** who has been appointed chief clerk in the Middleton Corporation Electricity Department.

Obituary

Prof. W. G. Griffiths.—We learn with regret of the death of Professor William G. Griffiths, who had been at University College, Galway, for over twenty years. His early training was received at the Heriot Watt College, and subsequently he spent some years with Messrs. Siemens at their Stafford Works. Professor E. W. Marchant, writing from the Laboratories of Applied Electricity, The University, Liverpool, says that electrical engineering in Ireland has suffered a severe loss from his sudden and untimely death. Prof. Marchant adds the following appreciation :—

"It may be said that the success of the School of Electrical Engineering in Galway was entirely due to his efforts. When he began, the laboratory of electrical engineering was practically non-existent, but with the comparatively small funds that were available to purchase apparatus and equipment, and very largely with his own hands, he equipped the electrical engineering department, so that to-day it is one of the best of the smaller laboratories in the country. Before the political troubles became acute in Ireland after the War, Professor Griffiths was drawing students from all parts of Ireland, and trained many men who now occupy important positions in the electrical engineering industry. His work in Galway had to be done almost unaided and the severe strain on him which this involved, together with the other activities which he undertook, were largely responsible for the breakdown in health from which he suffered. Many Irish electrical engineers must remember with gratitude the efforts that he made on their behalf, and his name will always be known as one of the pioneers of electrical engineering training in Great Britain."

Sir Charles Mandleberg.—Sir Charles Mandleberg, who died in London on January 14th at the age of 71 years, was not directly connected with the electrical industry. Readers of this "Review" may, however, remember the attention given here to his scheme for the development of our export trade. He announced it during the War and ultimately, after interesting discussion, it was incorporated in the Federation of British Industries and Sir Charles became chairman of the F.B.I. Overseas Trade Department.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Gardner-Edwards Diesel Rail Car Co., Ltd.—Private company. Registered in Belfast on January 5th. Capital £100 in £1 shares. Objects:—To carry on the business of designers and builders of railway vehicles and Diesel direct drive and Diesel-electric driven locomotives and rail cars, &c. The first director is C. Edwards, New Forge Lane, Malone Road, Belfast. Secretary: Irene Clarke. Registered office: 3, Brunswick Street, Belfast.

Conduit Fittings, Ltd.—Private company. Registered January 12th. Capital £500 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in conduit fittings at Frederick Street Works, Walsall, and elsewhere, and that of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, insulators, &c. E. J. Trawford, The Bungalow, Stafford Road, Bloxwich, Walsall, is the first director.

Stal Manufacturing Co., Ltd.—Private company. Registered January 13th. Capital £600 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in radio components, television apparatus, electrical goods, &c. The subscribers are:—H. N. Moss, "Town End," Portsmouth Road, Kingston-on-Thames; and A. W. Kingsley, "Rowardennan," Rusland Road, Harrow. The first directors are not named. Secretary: A. W. Kingsley.

Llanelly Electrical Engineering Co. (1932), Ltd.—Private company. Registered January 12th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical and radio retailers, contractors, &c. The subscribers are: J. Jones, Wyncourt, Llanelly, and D. M. Thomas, "Homestead," Tunnel Road, Llanelly. The first directors are to be appointed by the subscribers. Secretary: A. E. Morgan. Registered office: Compton House, Vaughan Street, Llanelly.

Vesta Electrical Co., Limited.—Private company. Registered January 15th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric lamp component parts and all electrical accessories to electric lamps or bulbs; electrical and general engineers, &c. The subscribers are: C. E. Morrell, 78, Park Lane, Wallington, Surrey, and C. H. Morrell, 34, Manor Road, Westcliff-on-Sea. C. E. Morrell is managing director for life. Registered office: 27, Broad Street House, Old Broad Street, E.C.2.

Alliance Radio, Ltd.—Private company. Registered January 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless receivers, electrical and wireless apparatus, etc. The first directors are: A. H. Jenkinson, 60, Ash Road, Sutton, Surrey, and P. Kader, 100, Ash Road, Sutton, Surrey.

Friar Radio Co., Ltd.—Private company. Registered January 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale and retail merchants in wireless and electrical accessories and goods, radio and electrical engineers, etc. The first directors are: H. Martin, 209, Moulsham Street, Chelmsford, and 326, High Road, Chadwell Heath, and Mrs. E. C. Martin, 9, Goresbrook Road, Dagenham. Registered office: 209, Moulsham Street, Chelmsford.

Northern Telephone & Electrical Co., Ltd.—Private company. Registered January 16th. Capital £500 in £1 shares. Objects: To carry on the business of electrical and telephone manufacturers' agents and electrical factors, importers and wholesale dealers in telephone accessories, wireless accessories, etc. The directors are: A. Long (chairman), 32, Baret Road, Walker Dene, Newcastle-on-Tyne, and J. M. Hall, 28, Ocean View, Whitley Bay. Secretary: L. Robson. Registered office: 20, St. Mary's Place, Newcastle-on-Tyne.

London Electrical Manufacturing Co., Ltd.—Private company. Registered January 13th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of wireless components and apparatus, electrical and scientific instruments, etc. The subscribers are: M. Emanuel, 243, St. Margaret's Road, Twickenham, and S. Podeshwa, 48, Cole Park Road, Twickenham. Secretary: M. Emanuel. Registered office: 28, Premier Place, Putney, S.W.

Returns of Electrical Companies

Hanson Electrical Supplies, Ltd.—Debenture dated December 29th, 1931, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: E. G. W. Wallis, 30, Monmouth Road, Bayswater, W.2.

Brown & Co. (Electrical Engineers), Ltd.—Capital £5,000 in £1 shares. Return dated October 12th, 1931. 4,529 shares taken up. £12 paid. £4,517 considered as paid. Mortgages and charges: Nil.

T. H. Satchwell, Ltd.—Capital £3,000 in £1 shares. Return dated August 21st, 1931. 2,502 shares taken up. £1,252 paid. £1,250 considered as paid. Mortgages and charges: Nil.

Holophane, Ltd.—Capital £100,000 in £1 shares. Return dated October 9th, 1931. All shares taken up. £7 paid. £99,993 considered as paid. Mortgages and charges: Nil.

Watsham's, Ltd.—Capital £10,000 in £1 shares. Return dated August 12th, 1931. 7,736 shares taken up. £2,901 paid. £4,835 considered as paid. Mortgages and charges: Nil.

Baynes Electrical Co., Ltd.—Capital £2,000 in £1 shares. Return dated October 16th, 1931. 214 shares taken up. £214 paid. Mortgages and charges: Nil.

Electric and General Industrial Trusts, Ltd.—Issue on December 31st of £3,750 debentures, part of a series already registered.

City Notes

The Westinghouse Brake & Saxby Signal Co., Ltd., held its annual meeting on January 15th, Lord Southborough presiding. In presenting the report and accounts the chairman said that while the turnover for the past year was above the average of the previous five years, competition was so keen that reduced prices had affected profits. They had acquired the patent rights for the British Empire for the eddy current rail brake, for which orders had been received from the London and North Eastern Railway. New uses had been found for their rectifiers, and development work was in progress which should further increase their field of service. Last year they decided to close down their York Road works and centralise all their manufactures in their factory at Chippenham, with a view to reducing working costs. The report and accounts were adopted.

Stewarts & Lloyds, Ltd., announced that their offer to purchase the preference and ordinary capital of the Scottish Tube Co. has been accepted by the holders of 97 per cent. in value of Scottish Tube shares. Extraordinary meetings of holders of the different classes of shares in Stewarts & Lloyds and an extraordinary general meeting of the company will be held on February 8th for the purpose of passing the necessary resolutions. It is proposed to increase the capital to £7,370,275 by the creation of 300,000 5 per cent. cumulative third preference shares of £1 each and 269,650 additional deferred shares of £1 each.

The Automatic Telephone Manufacturing Co., Ltd., has altered its title to the "Automatic Electric Co., Ltd." The change was approved at an extraordinary meeting on January 14th. The company also announces a number of changes in the board. The following have resigned:—Messrs. E. A. Mellinger, H. L. Harris, and D. Johnstone Sinclair, and Sir Max Muspratt, Bt. In their places the following gentlemen have been appointed directors:—Messrs. T. A. Eades, A. F. Bennett, J. Nixon, and G. W. Moore; the last-named is deputy-chairman.

The International Automatic Telephone Co., Ltd., announces that Messrs. E. A. Mellinger and H. L. Harris have resigned from the board of the company, while Sir Max Muspratt, Bt., Mr. John Ferguson and Mr. G. H. Nisbett have been appointed directors.

Companies Struck Off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Allied Electric Manufacturers, Ltd.
Commercial Telephone & Electrical Co., Ltd.
Pinnacle Switchgear, Ltd.
Siderman Electrical Supplies, Ltd.
Twiss Electric Transmission, Ltd.
Thermo Electric, Ltd.

The Anglo-American Telegraph Co., Ltd., has declared final dividends of 1½ per cent. on the ordinary and preferred stocks, making 3½ per cent. and 6 per cent. respectively for 1931. A dividend of 1½ per cent. for the year is also to be paid on the deferred ordinary stock.

Herbert Morris, Ltd., have declared a dividend for the half-year to January 31st at 6 per cent. (less tax at 5s. 6d. in the £) and 5 per cent. (free of tax up to 6s. in the £) on the cumulative preference shares.

The Clontarf & Hill of Howth Tramroad Co. has announced a dividend of 3s. on the ordinary shares, plus a bonus of 1s. per share (against 3s.).

The Brazilian Traction, Light & Power Co., Ltd., has announced a quarterly dividend of 25 cents per share on the ordinary shares of no par value.

Stocks and Shares

TUESDAY EVENING.

THE forthcoming Conference at Lausanne, upon the proceedings at which so much attention and interest have been fixed in advance, seems likely to turn out to be no more than a preliminary step, leading to adjournment and further delay in the hoped-for recommendation of War debts cancellation. It is tolerably obvious that the politicians in France and the United States are anything but eager to do anything definite in regard to the Wa rdebts question, in view of the fact that in both countries elections are at hand, the issues of which might be affected by the adoption of any strong line at Lausanne by the present Governments of the countries concerned. The effect upon Stock Exchange prices has been to make the latter somewhat dull, although the demand for gilt-edged securities continues. The 4½ per cent. debenture stocks of the London and Home Counties J.E.A. and the Central Electricity Board have both advanced to 87, showing a rise of 6 or 7 points from the lowest to which the stocks fell during the period of uncertainty which immediately followed the departure of this country from the gold standard. London Power 5 per cent. debenture has risen to 97½.

Home Electricity Supply

Amongst home electricity supply shares, Metropolitans at 38s. 9d. are 1/16 up, and County of London strengthened to 43s. 9d. City Lights eased off to 33s. 9d. Charing Cross ordinary at 27s. 6d. are ex the rights to the new shares. Dealings in the last-named can now be carried out, on a basis of 26s. per share. The company has adopted the

rather unusual procedure of allotting to proprietors the new shares upon definitive certificates, and not upon forms that contain a renunciation. This makes no particular difference to the seller, but, from the buyer's point of view, it is more expensive, because it costs him stamp and fee, whereas with renunciation letters this charge is not incurred.

The next company to issue new shares, and whose allotment letters may be out before these paragraphs are, is likely to be the Brompton & Kensington, whose present £1 shares stand at 27s. 6d. cum rights. The new shares will be quoted on the basis of 24s. 6d. The lately issued Metropolitans have firmed up to 37s. Westminster new ordinary at 24s. 6d. compare with 25s. 6d. for the old shares, the latter including the dividend for the final six months of 1931, whereas the new do not rank for payment of a dividend until six months ahead. Provincial shares are steady, and the only change in the Scottish group is a rise of 6d. in Clyde Valleys to 31s. 3d.

Home Railway Stocks

Metropolitan strengthened to 38½, showing a rise of 2 points, apparently on purchases encouraged by dividend estimates. The market is going for a final dividend making 3 per cent. for 1931, as against 3¼ in 1930 and 4 per cent. in 1929. Districts and the Underground issues show no changes. London Electric Railway 5 per cent. debenture at 95½ is a point to the good. The tramway and traction issues are equally quiet. British Electric Traction deferred stock has risen 20, to 720.

Cables and Wireless

The telephone and telegraph market is better, for no reason other than that of sentiment. Both the Anglo-American Telegraph stocks are 10s. up, the preferred being 92, the deferred 22. Cables & Wireless are a trifle better, but are not so good as they were at the end of last week, the uncertainty which crept in with regard to the outcome of the Lausanne Conference bringing in sales on behalf of people who had bought the stocks as a speculation. Globe Telegraph & Trust ordinary remain weak; the price at 7 shows a drop of £1, bringing it to the same line as that of the company's 6 per cent. preference. Marconi Marines are unchanged at 32s. 6d.

The American Telephone & Telegraph has been attracting a little attention in the neighbourhood of 175, and in International Telephone and Telegraphs a certain amount of speculation has been going on in the neighbourhood of 14. Anglo-Portuguese Telephone ordinary have eased off to 16s. 3d.

The Financial Bookshelf

One of the leading firms in the cable market has brought up to date its yearly manual of telegraph, telephone construction companies, &c., as investments. The book is in its nineteenth year, and contains particulars of the companies covered by the title. As an example of the care with which the work is done, mention may be made of the particulars of the Anchor Cable Company, whose debenture stock is guaranteed as to principal and interest by Callender's Cable & Construction Company. The dividend on the ordinary shares is traced back to 1905. Four pages are given up to Cables & Wireless statistics. The Henley dividends are shown from 1908, and the salient features of the last profit and loss accounts of the various companies are included in the information gratuitously given.

Manufacturing and Equipment

Improvements in General Electrics and in Associated Electrical Industries ordinary shares have lifted the prices to 42s. and 20s. 7½d. respectively. Henleys are better at 4¾, while Callenders eased off a little at 2 17/16. Siemens strengthened to 21s. 3d., Telegraph Constructions remained weak at £12. British Insulated went back to 52s. 6d. These movements are due to the changing hands of a comparatively small amount of shares in each case, the market being limited, and buyers finding almost as much difficulty in obtaining what they want as sellers do in getting the price that they ask. Associated Electrical Industries preference fell 9d. to 26s. 3d.; Callender's "B" preference are better at 25s.

Miscellaneous Matters

British Thomson-Houston preference at 22s. are 6d. harder. Whitehall Investments debenture has strengthened to 100. In the Indian group, Calcutta Electric ordinary rose to 32s. The Melbourne and the Adelaide Electric Supply Companies have felt to the full the difficulties and troubles of Australia, and these are reflected to some extent in the reports just published. Melbourne ordinary stock is quoted at 100 middle, Adelaide Electric 6 per cent. preference at 75. The last official record of business having been done in the latter stock was at 65, on April 24th, 1931. The company's 5 per cent. debenture stock is quoted at 95, and in this case the last-recorded transaction in the Stock Exchange Official List is at 77½, at the end of July, 1931. Atlas Trust ordinary have improved to 11s. 3d., and the preference to 20s. 6d. Tokyo Electric sixes at 87½ are 2 higher. Brazilian Tractions have advanced to 15¼, and the general trend of American-Canadian industrials is towards higher levels. Power Corporation of Canada are 4 dollars up at 32½. Shawinigans rose 2 to 34. Movements such as these are due mainly to readjustment of prices in London to those which come over from Montreal and New York. There is but little volume of active business passing in American-Canadian utility shares, with a very few exceptions, at the present time.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Jan. 19, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	87	+1	5 3 6
Charing Cross Ordinary	1	8½	8½	27/6	—1/6	5 1 10
Chelsea	1	8½	8½	26/-	—	5 7 8
City of London	1	10	10	33/9	—9d.	5 17 10
Clyde Valley	1	8	8	31/3	+6d.	5 2 5
County of London	1	11	11	43/9	+6d.	5 1 7
Edmundsons' 7% Pref.	1	7	7	23/6	—	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/-	—	4 18 7
Lancs. Light and Power	1	7	6½	24/6	—	5 6 6
London & Home Counties 4½% Deb.	Stock	—	4½	87	+2	5 3 6
London Electric	1	8½	9	33/-	—	5 9 1
Metropolitan	1	9	10	38/9	+1/8	5 3 3
Midland Counties	1	6½	7	26/3	—	5 6 6
Mid. Elec. Power	1	15	8	28/9	—	5 11 4
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—	5 3 3
Do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/-	—	4 18 7
Scottish Power	1	8	8	26/3	—	6 2 0
South London	1	8½	8½	25/6	—	5 9 6
Urban Ordinary	1	7	7	27/-	—	5 3 3
Westminster Ordinary	1	8½	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	—	7 6 4
Yorkshire Elec.	1	8	8	30/9	—	5 4 1

Home Rails

Central London Ord. Assented	Stock	4	4	67½	—	5 18 6
Metropolitan	,,	4	3½	38½	+2	9 1 10
Do. District	,,	5	5	59½	—	8 8 0
Underground Electric	1	8	8	19/-	—	8 8 6

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	92	+½	6 10 5
Do. Def.	,,	1½	1½	22	+¼	6 16 4
Cables & Wireless 5½% Pref.	Stock	5½	5½	48½	+1	—
Do. A 7½% Ord.	,,	Nil	—	18	—	—
Do. B Ord.	,,	Nil	—	11	+¼	—
Globe Tel. and T. Ord.	10	10	8½	7	—1	—
Do. do. Pref.	10	6	6	7	—	8 11 6
Great Northern Tel.	10	20	20	19½	—	10 5 4
Marconi-Marine	1	15	15	32/6	—	9 4 8
Oriental Telephone Ord.	1	12	12	2½	—	*5 16 0

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	720	+20	—
Do. do. Pref. Ord.	,,	8	8	110	—	7 5 6
Brazil Traction	100	8	—	15½	+¼	—
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	83½	—1	5 19 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	—	—
London United Tram Deb.	Stock	4	4	55½	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	32½	—5	15 7 8
Mexican Light Common	100	Nil	Nil	15	—	—
Do. 7% Pref.	100	7	7	25	—	20 0 0
Do. 1st Bonds	—	5	5	60½	—	8 5 4
Victoria Falls Ord.	1	15	15	55/-	—	5 9 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	1 1/16	+1/16	5 15 5
Do. Pref.	1	8	8	26/3	—9d.	6 2 0
Babcock & Wilcox	1	15	14	46/3	—	*6 1 1
British Aluminium Ord.	1	10	10	23/9	—	8 8 5
British Insulated Ord.	1	15	15	2½	—1/8	5 14 3
Brush Ord.	Stock	10	5	60	—	8 6 8
Callender's	1	15	15	2 7/16	—1/16	6 2 1
Do. 6½% Pref.	1	6½	6½	22/6	—	5 15 5
Crompton Parkinson Ord.	5/-	30	30	18/9	—	8 0 0
Do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3½	—	6 8 10
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7/6	—	—
Ferranti Pref.	1	7	7	20/9	—	6 15 0
G.E.C. Pref.	1	6½	6½	23/-	—	5 13 1
Do. Ord.	1	14	10	42/-	+9d.	4 15 3
Henley's	1	30	30	4¼	+1/8	6 3 1
Do. 4½% Pref.	5	4½	4½	4½	—	5 9 1
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	23/9	—	8 8 5
Siemens Ord.	1	7½	7½	21/3	+1/8	7 1 2
Telegraph Construction	12	10	7½	12	—	7 10 8

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930.

18,094. "Material of high electrical resistance, and method of using same." Siemens-Schuckertwerke Akt.-Ges. July 20th, 1929. (363,615.)

18,986. "Electric signalling and operating circuits." Telefonaktiebolaget L. M. Ericsson. June 21st, 1929. (363,696.)

19,028. "Wireless beacon transmitters." R. L. Smith-Rose and H. A. Thomas. June 21st, 1930. (363,617.)

21,710. "Electromagnetic devices for use in weak magnetic fields." Allgemeine Elektricitäts Ges. August 28th, 1929. (363,697.)

21,983. "Thermal overload trip switches." Allen West & Co., Ltd., and F. J. Pavitt. July 21st, 1930. (363,619.)

24,767. "Telephonic receiving apparatus." W. H. Adey. August 19th, 1930. (363,624.)

27,325. "Apparatus for the interconversion of electrical and mechanical energy such as is used in sound recording and reproducing apparatus." A. D. Blumlein. September 12th, 1930. (363,627.)

27,413. "Electrical transmission of intelligence." S. F. Stein. September 13th, 1930. (363,629.)

28,014. "Oil- or compound-filled electrical insulators." A. Reyrolle & Co., Ltd., and R. W. H. Bloxam. September 19th, 1930. (363,638.)

28,170. "Electrically operated alarm devices." T. P. V. Ferraro. September 20th, 1930. (363,643.)

28,186. "Electrostatic voltmeters." Ferranti, Ltd., and E. H. W. Banner. September 20th, 1930. (363,645.)

28,305. "Turbo-electric ship propulsion equipments." British Thomson-Houston Co., Ltd., G. O. Watson, and P. D. Morris. September 22nd, 1930. (363,665.)

28,433. "Electrical condensers." Sparks-Withington Co. February 11th, 1930. (363,717.)

30,488. "Operating mechanism for electric circuit-breakers and the like." G. W. Davidson and Associated Electrical Industries, Ltd. October 11th, 1930. (363,750.)

30,923. "Electron-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. November 13th, 1929. (363,755.)

30,997. "Dynamo-electric machines." General Electric Co., Ltd., and R. Orsettich. October 16th, 1930. (363,756.)

31,215. "Transformers." British Thomson-Houston Co., Ltd. October 19th, 1929. (363,759.)

31,768. "Electric apparatus for keeping food hot or heating same." E. G. F. Lockyer and Hotlock, Ltd. October 22nd, 1930. (363,761.)

33,286 "Electrically heated hot-plates." L. Nicholson, W. Needham, and Associated Electrical Industries, Ltd. November 5th, 1930. (363,774.)

34,091. "Welding electrodes and rods." British Thomson-Houston Co., Ltd. November 13th, 1929. (363,784.)

34,186. "Frequency meters." Kolster-Brandes, Ltd. (Kolster Radio Corp.). November 13th, 1930. (363,785.)

35,478. "Hydraulic operating mechanism for electric switches." British Thomson-Houston Co., Ltd. November 26th, 1929. (363,795.)

36,244. "Electrical junction and like metal boxes." Simplex Conduits, Ltd., and H. F. McLoughlin. December 2nd, 1930. (363,799.)

36,403. "Quick-action electric switches of the ironclad type." J. A. Crabtree. December 3rd, 1930. (363,801.)

36,485. "Magnets of loudspeaking instruments." H. Strumpf Ges. October 22nd, 1930. (363,802.)

37,540. "Electrodes for use in electric arc welding and the fusion deposition of metals." Quasi-Arc Co., Ltd., and A. P. Strohmenger. December 12th, 1930. (363,815.)

38,221. "Electric protective devices." British Thomson-Houston Co., Ltd. December 18th, 1929. (363,826.)

38,972. "Automatic knife actuation indicating device for use with electric switch means in pile cutting machines." Velvet Machines & Tools, Ltd., and A. Roger. December 29th, 1930. (363,839.)

39,205. "Construction or arrangement of alternating current alarm." Aktieselskapet Elektrisk Bureau. December 31st, 1929. (363,842.)

1931.

3,574. "Photo-electric cells." General Electric Co., Ltd., and N. R. Campbell. February 4th, 1931. (363,877.)

5,378. "Portable electric massage appliance." W. C. Tyler. February 20th, 1931. (363,894.)

5,948. "High frequency transmission systems." Soc. Francaise Radio-Electrique. March 5th, 1930. (363,904.)

8,089. "Electric discharge tubes for the emission of rays." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 4th, 1930. (363,914.)

8,205. "Manufacture of electrical incandescent lamp bulbs or like hollow glass vesels." General Electric Co., Ltd., May 22nd, 1930. (363,916.)

9,248. "Drive transmission for electrically driven vehicles." G. Turrinelli. March 26th, 1931. (363,922.)

9,343. "Device for preventing the theft of incandescent electric lamps." R. Weil. March 27th, 1931. (363,924.)

9,584. "Electric welding apparatus." Wilson Welder and Metals Co., Inc. April 17th, 1930. (363,926.)

11,466. "Glass electrical insulators, and method of making the same." Corning Glass Works. May 7th, 1930. (363,934.)

14,580. "Method of influencing the current or tension in an electric circuit by means of radiation." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 30th, 1930. (363,947.)

15,221. "Strings of insulators on overhead electric lines or conductors." Pirelli-General Cable Works, Ltd., and C. E. Matthews. May 22nd, 1931. (363,952.)

15,957. "Filters for suppressing high-frequency disturbances in electric conductors." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 7th, 1930. (363,956.)

18,843. "Method of detecting or indicating faults in pressure circuits of electrical apparatus, more especially in the pressure circuits of alternating current meters." Landis & Gyr Soc. Anon. July 24th, 1930. (363,967.)

21,911. "Electric heaters." British Thomson-Houston Co., Ltd. August 8th, 1930. (363,975.)

23,594. "Metallic vapour rectifiers." International General Electric Co., Inc. August 21st, 1930. (363,976.)

24,362. "Apparatus for cooling and preliminary washing gases, particularly blast furnace gases which are to be purified by electrical precipitation." Lodge-Cottrell, Ltd. August 29th, 1930. (363,978.)

26,187. "Electrical transmission of pictures." British Thomson-Houston Co., Ltd. September 19th, 1930. (363,979.)

26,191. "Automatic standby devices for wireless receiving apparatus." L. L. E. Chauveau. September 18th, 1930. (363,981.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 13th.

Meteor. No. 527,626. Class 8. Wireless telegraphic and telephonic instruments and apparatus and parts thereof.—R.R., Ltd., 159, Borough High Street, S.E.1.

Cleon. No. 527,676. Class 8. Electrically illuminated signs. —Claude-General Neon Lights, Ltd., Queen's House, Kingsway, W.C.2.

Two Men and Cable (design only). Nos. 527,523 and 527,524. All goods in Classes 8 and 13.—C.A.V.-Bosch, Ltd., Warple Way, Acton Vale, W.3.

Memten. No. 526,679, and Mendix, No. 527,107. Class 13. Electric switches, combined switches and fuses, fusible cutouts, &c.—Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham.

The British Industries Fair

IN our last issue we printed a list of the firms which are exhibiting at the British Industries Fair which opens on February 22nd. The arrangements of the Electrical Section which is now an important feature of the Birmingham Section is in the hands of the following Committee which, as will be seen, is thoroughly representative of all branches of the industry:—

Mr. T. R. Martin (chairman); Mr. H. H. Berry (deputy-chairman); Dr. A. H. Railing (G.E.C.); Mr. E. J. Jennings (Birmingham Corporation); Capt. J. M. Donaldson (President, I.E.E.); Mr. A. Albrecht (Director and Secretary, Electrical Wholesalers' Federation); Mr. E. G. Batt (Chairman, Heating and Cooking Section, B.E.A.M.A.); Mr. A. G. Beaver (Chairman of Council, Electrical Merchants' and Manufacturers' Association); Mr. A. C. Cramb (Director, British Electrical Development Association); Major E. I. David (President, Association of Mining Electrical Engineers); Mr. D. N. Dunlop (Director, B.E.A.M.A.); Mr. H. Meighan (President, Electrical Contractors' Association of Scotland); Lt.-Col. W. J. Kent (Electrical Porcelain Manufacturers' Association); Mr. C. G. Morley New (President, Incorporated Municipal Electrical Association); Mr. R. W. L. Phillips (Chairman of Council, British Electrical Development Association); Mr. W. R. Rawlings (President, Electrical Contractors' Association); Mr. C. W. Sully (Director, Electric Lamp Manufacturers' Association); and Mr. V. Watlington (Chairman of Council, B.E.A.M.A.).

As in previous years most of the principal electrical institutions and associations are paying official visits to the Fair, and we give some details of these visits. The British Electrical Development Association has arranged a dinner in Birmingham for the evening of March 2nd.

Tuesday, February 23rd.

Electrical Association for Women.

Wednesday, February 24th.

Institution of Electrical Engineers (South-Midland Centre).
Midland Section, I.M.E.A.
Electrical Contractors' Association.
Electrical Contractors' Association of Scotland.
Association of Consulting Engineers.
Association of Supervising Electrical Engineers.
Illuminating Engineering Society.
Municipal Tramways & Transport Association.
Tramways & Light Railways Association.

Friday, February 26th.

Association of Mining Electrical Engineers.

Saturday, February 27th.

Electrical Power Engineers' Association.
Students' Section, South Midland Centre, I.E.E.

Wednesday, March 2nd.

Institution of Electrical Engineers, (Council).
Incorporated Municipal Electrical Association, (Council).
British Electrical Development Association.
Incorporated Association of Electric Power Companies.
Provincial Electric Supply Association.
Electrical Wholesalers' Federation.
London Electricity Supply Association.
British Electrical & Allied Manufacturers' Association.

Thursday, March 3rd.

Electrical Wholesalers' Federation.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Infirmary, Foresterhill; G. B. Nicol, architect, 367, Union Street.

Accrington.—Omnibus station, Marquis Street; borough engineer.

Allestree (DERBY).—Business stores, café and dance hall, Hillside Estate, for S. F. Barnes.

Appleby (CUMBERLAND).—Church for the Wesleyan Methodist Church; A. Knewstubb, architect, St. Andrew's Chambers, Penrith.

Ashford (KENT).—Houses, Smarden, Pluckley, Charing, Shadoxhurst and Great Chart, for the West Ashford R.D.C.; surveyor.

Basingstoke.—Re-erection of Steventon Manor, residence of Mr. Onslow-Fane (about £45,000).

Bedford.—Houses (52), various parishes; R.D.C. architect.

Bishop's Stortford.—Extensions, Haymeans Institution (£30,895); G. L. Thurgood & Son, Ltd., Much Hadham.

Blackpool.—Development, Norbreck Estate; J. Cryer & Sons. Site development, Blackpool Road and Staining Road; Walton Bros. Development, Haddle House Estate, for J. W. Anderson; J. G. Greenwood. Shops (10) and café, Promenade and Station Road; J. R. Quayle. Development, Pelham Mount Estate; exors. of T. W. Kay.

Blyth.—Additions, Newsham Junior School, for the T.C.; L. Leeper, borough engineer, Seaforth Street.

Bootle.—Houses (25), Fernhill Road; North Western Estates Developments, Ltd. Extensions, Secondary School (£10,200), for the E.C. Houses (322), Caddicks Field Estate and Bailey Drive (22); borough engineer.

Bedlington (NORTHUMBERLAND).—Cinema and skating rink; J. G. Hall, builder.

Bridlington (YORKS).—Bazaar premises, Prince Street, for Marks & Spencer, Ltd., 21, Chiswell Street, London, E.C.

Burton-on-Trent.—Shops (20), with arcade, Market Place; J. H. Birch, of Roberts & Birch, Ltd.

Bury.—Houses (330), Huntley Ford; J. Chadwick, borough engineer, Bank Street.

Carlisle.—Houses (64) for the City Council; P. Dalton, surveyor, Town Hall.

Cheltenham.—Congregational Church, Priory Terrace; Rev. W. E. Cloutman. Houses (22), Mead Road; J. D. Bendall and Sons, builders, Trowscoed Lodge, Naunton Lane, Leckhampton.

Clacton-on-Sea (ESSEX).—Houses (68), Burrsville Park Estate, for W. Renshaw.

Coalville (LEICESTERSHIRE).—Houses (110), for the U.D.C.; surveyor.

Congleton (CHESHIRE).—Houses (100), for the T.C.; borough surveyor.

Cradley Heath (STAFFS).—Cinema, Cradley Road, for Alderman F. J. Ballard; Webb & Gray, architects, Dudley.

Darlington.—Cinema (£20,000), Bondgate; J. Clayton, architect, High Row Chambers.

Daventry.—Extensions, Poor Law Hospital; Northants C.C. Assistance Committee.

Ealing.—Houses (42), Ridding Lane, for Walton Heath Land Co., Ltd.; G. Warren-Peachey, architect, 7 and 8, Norfolk Street, W.C.2. Shops and flats, Priory Park Parade, Hanger Lane; T. P. Bennett & Son, architects, 41, Bedford Row, W.C.1. Houses (54), Perivale Lane; Wembley U.D.C. surveyor. Houses (108), Greenford Lane, Oldfield Lane, and Ingram Lane, for A. W. Coomber; W. Henden Winder, 10, Fouberts Place, Regent Street, W.1, architect. Houses (28), Brentmead Place, for A. Graham; W. Thorpe, 1, Cheapside, Hale Lane, Edgware, architect. Houses (20), Wordsworth Avenue and Shelley Avenue, for Mrs. J. Sherry; Greenford Estates, Ltd., Coston's Lane. Factory, Bideford Avenue; Percy Bilton (Inc.), Ltd., 113, Park Street, W. Flats, &c., Hanger Lane; Gale, Heath & Smith, architects, 5, New Bridge Street, E.C.4.

Eastbourne.—Houses (24) for Winkney Estate, Ltd., Percival Road; B. Stevens, architect.

Eccles.—Houses (196), Peel Green; borough engineer.

Ellesmere (SALOP).—Houses (26), for the R.D.C.; surveyor.

Elemore (Co. DURHAM).—Pit-head baths, with lighting and heating (£25,000), for Lambton, Hetton & Joicey Collieries, Ltd.

Essex.—Schools, Rush Green and Bush Elms, Hornchurch, for the county E.C.; J. Stuart, county architect, Chelmsford. County hall extensions (£18,950), for the C.C.; J. Stuart, county architect, Chelmsford.

Gainsborough.—Houses (50), for the U.D.C.; B. Pumfrey, Ltd., builders.

Galashiels.—Corporation housing scheme; G. and J. Hall, architects.

Gateshead-on-Tyne.—Premises in High Street for Martins Bank, Ltd.; Marshall & Tweedy, Mervyn House, Pilgrim Street, Newcastle.

Golborne (LANCS).—Houses (50), for the U.D.C.; surveyor.

Gravesend.—Stores for Home & Colonial, Ltd., High Street; F. J. Hepple, Ltd.

Hinckley (LEICS).—Shops and warehouses, Regent Street, for Atkins Bros.; Lt.-Col. E. C. Atkins, architect, Stretton House, Stretton Baskerville.

Houghton-le-Spring (DURHAM).—Houses (100) for the U.D.C.

Hunmanby (YORKS).—Extensions, Hall School, for the trustees; G. E. Withers, architect, 50, Cannon Street, E.C.

Hyde.—Works extensions, Mary Street; C. Watkin & Co., Manchester.

Irish Free State.—(DUNGANNON, TYRONE).—Technical school; Regional Education Committee. (CASTLEBAR). — Hospital (£40,000) for C.C. (KERRY).—Technical schools, Kenmare, Dingle, and Castleisland; Kerry Vocational E.C. (WEXFORD).—Houses, Whitehall Road (28), and Davitt Road (6), for the Corporation.

Keighley.—Iron foundry, South Street, for the C.W.S. Ironworks, Ltd.; Architects' Department, 1, Ballon Street, Manchester.

Kenilworth (WARWICKSHIRE).—Houses (24), for the U.D.C.; surveyor.

Kingsbridge (DEVON).—Houses (£8,114), for the U.D.C.

Kirkcaldy.—Extensions to High School for T.C.

Leeds.—Extensions, St. Margaret's Home, Clarendon Road; city architect.

Leigh.—Boys' school (£25,000); J. C. Pharoah, director of education.

London.—(EAST HAM).—Extensions, Trebor Works, Shaftesbury Road; J. C. Mellis & Co. Nursery Block, Aldersbrook Children's Homes, for B.C. (£24,128); Hammond & Barr, Ltd., contractors. Swimming baths extensions for B.C. (£13,501); borough engineer. (EDMONTON).—Extensions to factory, Chichester Road, Edmonton; A. J. King, Ltd., builders, 62, Southgate Road, N.1.

Manchester.—Enlargement of St. Aloysius School; Catholic trustees. Rebuilding Victoria Inn, Mauldeth Road, Burnage; licensee. School, Rusholme; St. Kentigern's Catholic trustees. Junior school, Yew Tree Road, for the E.C.

Motherwell.—Houses, Orbiston Street (£2,775), and Cambusnethan Street (£2,900); burgh surveyor.

Newcastle-on-Tyne.—Shops and houses in Shields Road; Mulhearn, builders, Benton. Premises in Northumberland Street for Messrs. Woodhouse; M. K. Glass, architect, 20, Saville Row, Newcastle.

Newport (MON).—Alterations, Empire Theatre, Charles Street; licensee. Development, Greenmeadow Estate; W. J. S. Sparks.

Northampton.—Omnibus station, Bridge Street; borough engineer.

Oldbury.—Houses (84), Newbury Lane; W. Greenwood, surveyor, Council offices.

Oldham.—Houses, Abbey Hills Road; borough surveyor.

Oxford.—Houses (100), Rose Hill Estate; city estates surveyor. Baths, St. Aldate's area; city surveyor. Waterworks, Swinford (£83,000); Edwards Construction Co., Ltd., London. Extensions, Wingfield Hospital; governors. Parochial buildings, New Inn Hall Street; Wesleyan trustees. Houses, Rose Hill Estate (78), and Towns Road Estate, Cowley (114); N. Moss & Son. Development, Sandhills Estate, London Road; Cripps & Stewart. Senior school, Headington (£15,000), and secondary school, Southfield (£35,000) for the E.C.

Perthshire.—Rebuilding Tyndrum Hotel (electric lighting); Simpson, McMichael and Davidson, architects, King Street, Stirling.

Plymouth.—Houses (30) and flats (16), Vicarage Road (£17,560); A. N. Coles (Contractors), Ltd.

Pontefract.—Waterworks pumping station, &c (£40,000), for the T.C.; F. W. Hodson, engineer.

Portsmouth.—Extensions, Clarence Pier; J. Lay & Co., Ltd. Conversion of children's homes to mental institution; city engineer.

Prudhoe (NORTHUMBERLAND).—Extensions to the Prudhoe Colony (£48,000); J. H. Morton & Sons, architects, Fowler Street, South Shields.

Rotherham.—Conversion of Whiston Grange to maternity home (£10,000); West Riding C.C. Health Committee. Houses (27), Bramley, for the R.D.C.; surveyor.

Rugby.—Houses, Naseby Road, Rugby; Browning Bros., builders, Vicarage Lane, Humberstone, Leicester.

Runwell.—Mental institution; Southend and East Ham Corporations.

Saffron Walden.—Joint Methodist Church, Stanstead; trustees.

Seaham Harbour.—Houses (120) for the U.D.C.; surveyor, Council offices.

South Shields.—Shops (4) and houses (16), Tyne Dock Estate (£5,350); flats (120), Green Lane (£37,000); houses (296), Farnham Road (£106,000); borough engineer. Five shops for Mr. A. Ridley; J. W. Hanson & Sons, architects, 18, Eldon Square, Newcastle.

Stafford.—Telephone exchange for H.M. Office of Works, King Charles Street, London, S.W.

Stoke Golding.—Church; George Baines & Son, architects, 121, Victoria Street, S.W.1.

Sunderland.—Cinema (3,000 seats); Black Bros., Holmside. Wheatsheaf Hotel; F. Caws, architect, 22, Fawcett Street.

Sussex.—Central school, Rye, for the County E.C.; director of education, Lewes.

Sutton Coldfield.—Houses (23), Antrobus Road; Excelda Housing Society.

Swindon.—Houses (24), Hughes Street; Bishop & Fisher.

Swinton and Pendlebury (LANCS).—Houses (150), Beech Farm Estate, for the U.D.C.; H. Entwistle, surveyor.

Tenterden (KENT).—Post office for H.M. Office of Works, King Charles Street, S.W.

Thornaby-on-Tees.—Houses, Grange Farm Estate; W. E. Orchard, borough engineer.

Tilbury (ESSEX).—Boot factory, St. Clere, East Tilbury, for Mr. Bata, Zlin, Czechoslovakia. Cinema, Civic Square; Major Oliver, architect.

Urmston.—Houses (45), near Ciss Lane, for U.D.C.; Jas. Heath, architect, Council offices, Crofts Bank Road.

Wakefield.—Extensions, Park Lodge Hospital (£5,000); city surveyor. Houses (23), Brinswick Street; city housing architect.

Wallsend-on-Tyne.—Housing scheme (12 acres), Bewicke; borough engineer. Flats (60), Archer Street site, for T.C. (£13,686); R. Barron & Co., Ltd., builders, Coundon, Bishop Auckland.

Warsop (NOTTS).—Council offices and child welfare centre for the U.D.C.; Vallance & Westwick, architects, White Hart Chambers, Mansfield.

Washington (DURHAM).—Houses (56) for the U.D.C.; J. Swaddle, surveyor, Council offices.